

**TABLE 1  
AVERAGE DAILY VEHICLE TRIPS\***

CIRCULATION ELEMENT ROADS		LEVELS OF SERVICE				
Road Classification	# of Travel Lanes	A	B	C	D	E
Expressway (6.1)	6	<36,000	<54,000	<70,000	<86,000	<108,000
Prime Arterial (6.2)	6	<22,200	<37,000	<44,600	<50,000	<57,000
Major Road	(4.1A)	4	<14,800	<24,700	<29,600	<33,400
	w/ Intermittent Turn Lanes (4.1B)	4	<13,700	<22,800	<27,400	<30,800
Collector	4	<13,700	<22,800	<27,400	<30,800	<34,200
Boulevard	w/ Raised Median (4.2A)	4	<18,000	<21,000	<24,000	<27,000
	w/ Intermittent Turn Lanes (4.2B)	4	<16,800	<19,600	<22,500	<25,000
Town Collector	2	<3,000	<6,000	<9,500	<13,500	<19,000
Community Collector	w/ Raised Median (2.1A)	2	<10,000	<11,700	<13,400	<15,000
	w/ Continuous Left Turn Lane (2.1B)	2	<3,000	<6,000	<9,500	<13,500
	w/ Intermittent Turn Lane (2.1C)	2	<3,000	<6,000	<9,500	<13,500
	w/ Passing Lane (2.1D)	2	<3,000	<6,000	<9,500	<13,500
	No Median (2.1E)	2	<1,900	<4,100	<7,100	<10,900
Light Collector	w/ Raised Median (2.2A)	2	<3,000	<6,000	<9,500	<13,500
	w/ Continuous Left Turn Lane (2.2B)	2	<3,000	<6,000	<9,500	<13,500
	w/ Intermittent Turn Lane (2.2C)	2	<3,000	<6,000	<9,500	<13,500
	w/ Passing Lane (2.2D)	2	<3,000	<6,000	<9,500	<13,500
	No Median (2.2E)	2	<1,900	<4,100	<7,100	<10,900
		2	<1,900	<4,100	<7,100	<10,900
	w/ Reduced Shoulder (2.2F)	2	<5,800	<6,800	<7,800	<8,700
Rural Collector	2	<1,900	<4,100	<7,100	<10,900	<16,200
Rural Light Collector	2	<1,900	<4,100	<7,100	<10,900	<16,200
Rural Mountain	2	<1,900	<4,100	<7,100	<10,900	<16,200
Recreational Parkway	2	<1,900	<4,100	<7,100	<10,900	<16,200
Minor Collector	w/ Raised Median (2.3A)	2	<3,000	<6,000	<7,000	<8,000
	w/ Intermittent Turn Lane (2.3B)	2	<3,000	<6,000	<7,000	<8,000
	No Median (2.3C)	2	<1,900	<4,100	<6,000	<7,000
NON-CIRCULATION ELEMENT ROADS**		LEVELS OF SERVICE				
Residential Collector	2	-	-	<4,500	-	-
Rural Residential Collector***	2	-	-	<4,500	-	-
Residential Road	2	-	-	<1,500	-	-
Rural Residential Road***	2	-	-	<1,500	-	-
Residential Cul-de-Sac or Loop Road	2	-	-	<200	-	-

\* The values shown are subject to adjustment based on the geometry of the roadway, side frictions, and other relevant factors as determined by the Director, Department of Public Works.

\*\* Levels of service are not applied to residential streets since their primary purpose is to serve abutting lots, not carry through traffic. Levels of service normally apply to roads carrying through traffic between major trip generators and attractors.

\*\*\* Rural Residential Collectors and Rural Residential Roads are intended to serve areas with lot sizes of 2 acres or more which do not have a demand for on-street parking. On-street parking is not assured for these cross sections. Additional right-of-way is needed if on-street parking is in paved area.

\*\*\*\* See Tables 2A and 2B for roadway surfacing and right-of-way widths.

- C. Where a public road is adjacent to the project's boundary, the developer shall construct any required curbs, gutters, ditches/ and/or sidewalks and a minimum of one-half of the surfacing width specified in Tables 2A and 2B for that particular road classification, but in no case less than 28 feet of paving and 40 feet of grading plus slopes.
- D. Travel lanes are 12 feet wide unless otherwise specified.

#### **Section 4.4 CIRCULATION ELEMENT ROADS – SUPPLEMENTAL INFORMATION**

The following requirements supplement the minimum standards found in Tables 2A and 2B:

##### **A. Access**

It is intended that the roads identified on the County General Plan depict corridors for public mobility and access which are planned to meet the needs of the existing and anticipated population of San Diego County. It is intended that Circulation Element roads provide public mobility with minimum interference from local traffic as it accesses a General Plan road. Therefore, Circulation Element roads require access control to minimize traffic conflicts. Access control for each Circulation Element road classification shall be as follows:

##### **1. Expressways**

No lot or private road access allowed; only selected public road access with full grade separations.

##### **2. Prime Arterials**

Access is fully controlled with new development required to provide signalized intersections for ingress and egress. Residential lots are required to be served from interior residential roads.

##### **3. Major Roads**

Access is controlled with new development required to provide access roads, common driveways and signalized intersections. Residential lots are required to be served from interior residential roads.

##### **4. Collector Roads/Rural Collector Roads**

Access is controlled with new development required to provide common driveways, access roads and, on occasion, signalized intersections. Residential lots are required to be served from interior residential roads.

# TABLE 2A: COUNTY OF SAN DIEGO - PUBLIC ROAD STANDARDS

## CLASSIC CIRCULATION ELEMENT ROAD CLASSIFICATIONS

ROAD CLASSIFICATION	# LANES / LANE WIDTH	MEDIAN WIDTH	ROAD SURFACING WIDTH	R.O.W. WIDTH	PAVED SHOULDER (# / WIDTH)	PARKWAY WIDTH	MIN. CURVE RADIUS	MAX. DESIRABLE GRADE	MIN. DESIGN SPEED (MPH)
Expressway (6.1)	6 / 12'	34'	126'	146'	2 / 10'	10'	1,700'	6%	65
Prime Arterial (6.2)	6 / 12'	14'	102'	122'	2 / 8'	10'	1,700'	6%	65
Major Road (4.1A)	4 / 12'	14'	78'	98'	2 / 8'	10'	1,200'	7%	55
Collector	4 / 12'	-	64'	84'	2 / 8'	10'	1,200'	7%	55
Town Collector	2 / 12'	12'	54'	74'	2 / 8'	10'	500'	9%	40
Light Collector	2 / 12'	-	40'	60'	2 / 8'	10'	700'	9%	45
Rural Collector	2 / 12'	-	40'	84'	2 / 8'	22'	500'	12%	40
Rural Light Collector	2 / 12'	-	40'	60'	2 / 8'	10'	500'	12%	40
Rural Mountain	2 / 12'	-	40'	100'	2 / 8'	30'	500'	12%	40
Recreational Parkway	2 / 12'	-	40'	100'	2 / 8'	30'	400'	12%	25

## MODERN CIRCULATION ELEMENT ROAD CLASSIFICATIONS

Major Road	4 / 12'	-	64' - 78'	84' - 98'	2 / 8'	10'	1,200'	7%	55
* With Intermittent Turn Lanes (4.1B)									
Boulevard	4 / 12'	14'	78'	106'	2 / 8'	14'	500'	9%	40
*** With Raised Median (4.2A)									
*** With Intermittent Turn Lanes (4.2B)									
Community Collector	2 / 12'	14'	54'	74'	2 / 8'	10'	700'	9%	45
** With Raised Median (2.1A)									
** With Continuous Left Turn Lane (2.1B)									
*** With Intermittent Turn Lanes (2.1C)									
*** With Passing Lane (2.1D)									
* No Median (2.1E)									
Light Collector	2 / 12'	14'	54'	78'	2 / 8'	10'	500'	9%	40
** With Raised Median (2.2A)									
** With Continuous Left Turn Lane (2.2B)									
*** With Intermittent Turn Lanes (2.2C)									
*** With Passing Lane (2.2D)									
** No Median (2.2E)									
*** With Reduced Shoulder (2.2F)									
Minor Collector	2 / 12'	14'	54'	82'	2 / 8'	10'	350'	12%	35
*** With Raised Median (2.3A)									
*** With Intermittent Turn Lanes (2.3B)									
*** No Median (2.3C)									

NOTES: 1 Minimum longitudinal gradient shall be 1.0 percent for all road classifications shown above.

2 The maximum grade for a permanent cut-de-sac street turning area shall be 6 percent.

3 The maximum grade for a temporary cut-de-sac street turning area shall be that of the classification of the road being constructed.

4 For standards, see County Design Standard Drawing DS-2, DS-3, DS-4, and Section 4.5N of these Standards.

5 Additional pavement and ROW may be required for CE Collectors (4 feet) and Light Collectors (12 feet) in Industrial/Commercial Zones.

6 CE roads needing additional turn lanes will require an additional 12 to 14 feet of pavement and ROW for each lane.

7 The maximum superelevation allowed on CE roads is 6%. Superelevation is not normally required on Non-CE roads.

8 CE roads designated with Bike Lanes will require an additional 10 feet of pavement and ROW. This may be increased to 12' for Collector Roads and above based upon the provisions in Section 7.3 of these standards.

9 The minimum curve radii, shown in the table above, are based on the design speed with 6% superelevation.

10 Interim roads are to be a minimum of 28 feet A.C. within a 40 feet graded roadbed. They may be larger if traffic volumes require more travel lanes.

LEGEND: \* Similar to existing Collector Road

\*\* Similar to existing Town Collector

\*\*\* Similar to existing Rural Collector

+ Same as existing Light Collector

++ Similar to existing Rural Light Collector

+++ New Classification Standard

# TABLE 2B: COUNTY OF SAN DIEGO - PUBLIC ROAD STANDARDS

## NON-CIRCULATION ELEMENT ROAD CLASSIFICATIONS

ROAD CLASSIFICATION	# LANES / LANE WIDTH	MEDIAN WIDTH	R.O.W. WIDTH	ROAD SURFACING WIDTH	PAVED SHOULDERS (# / WIDTH)	PARKWAY WIDTH	MINIMUM CURVE RADIUS	MAXIMUM DESIRABLE GRADE	MINIMUM DESIGN SPEED (MPH)
Residential Collector	2 / 12'	-	60'	40'	2 / 8'	10'	300'	12%	30
Residential	2 / 12'	-	56'	36'	2 / 6'	10'	200'	15%	30
Residential Cul-de-sac	2 / 12'	-	52'	32'	2 / 4'	10'	200'	15%	30
Residential Loop	2 / 12'	-	52'	32'	2 / 4'	10'	200'	15%	30
Industrial/Commercial Collector	4 / 12'	-	88'	68'	2 / 10'	10'	300'	8%	30
Industrial/Commercial	2 / 16'	-	72'	52'	2 / 10'	10'	200'	8%	30
Industrial/Commercial Cul-de-sac	2 / 16'	-	72'	52'	2 / 10'	10'	200'	8%	30
Frontage	2 / 12'	-	52' min	32' min	1 / 8'	10'	See above	See above	-
Alley	2 / 10'	-	20-30'	20-30'	None	None	50'	12%	n/a
Hillside Residential	See NOTE 4	-	-	-	-	-	-	-	-
Rural Collector *	2 / 12'	-	48'	28'	2 / 2'	10'	300'	12%	30
Rural Residential	2 / 12'	-	48'	28'	2 / 2'	10'	200'	15%	30

LEGEND: \* Serves lots > 2 acres in size w/  
no demand for on-street parking

- NOTES:
- 1 Minimum longitudinal gradient shall be 1.0 percent for all road classifications shown above.
  - 2 The maximum grade for a permanent cul-de-sac street turning area shall be 6 percent.
  - 3 The maximum grade for a temporary cul-de-sac street turning area shall be that of the classification of the road being constructed.
  - 4 For standards, see County Design Standard Drawing DS-2, DS-3, DS-4, and Section 4.5N of these Standards.
  - 5 The minimum curve radii, shown in the table above, are based on the design speed with 6% superelevation.
  - 6 Interim roads are to be a minimum of 28 feet A.C. within a 40 feet graded roadbed. They may be larger if traffic volumes require more travel lanes.

5. Collector Roads/Rural Collector Roads

Access is controlled with new development required to provide common driveways, access roads and, on occasion, signalized intersections. Residential lots are required to be served from interior residential roads.

6. Community Collector

Access is controlled with new development required to provide common driveways, access roads and, on occasion, signalized intersections. Residential lots are required to be served from interior residential roads.

7. Boulevard

Access is controlled with new development required to provide common driveways, access roads and, on occasion, signalized intersections. Residential lots are required to be served from interior residential roads.

8. Town Collector Roads

Access is controlled with new development required to provide common driveways, access roads or signalized intersections. Residential lots are required to be served from interior residential roads. Commercial areas are required to provide driveway separation as identified in Section 6.1.C.2 as if the driveways were Non-Circulation Element roads.

9. Light Collector Roads/Rural Light Collector Roads

Access is generally controlled, with subdivisions and commercial developments required to provide access roads and common driveways respectively. Residential lots are required to be served from interior residential roads, where possible.

10. Minor Collector

Access is generally controlled. Lots in subdivisions are required to be served from interior residential roads. Commercial areas are required to be provided with common driveways for access.

10. Recreational Parkways/Rural Mountain Roads

Access is generally controlled. Lots in subdivisions are required to be served from interior residential roads. Commercial areas are required to be provided with common driveways for access.

**B. Intersections**

Intersectional sight distance shall have priority over all other standards and shall be achieved within standard right-of-way.

In general, at the intersection of Circulation Element roads, the right-of-way and improvement requirements of each leg of the intersection may be changed to the next higher road classification or to a special intersection design based on a traffic analysis of the intersection.

In the event a subdivision creates traffic requiring the construction of additional turning lanes and other safety features at a designated intersection, the subdivider shall construct or reconstruct such intersection.

**C. Additional Turn Lanes**

**1. Prime Arterial and Expressway, if not grade separated**

Where the left turn traffic volume is estimated to exceed 300 vehicles at peak hour, an additional 12 feet of right-of-way may be required for provision of a dual left turn lane. Minimum length of the additional left turn lane shall be 300 feet plus appropriate taper.

**2. Major Road/Town Collector Road**

Where the left turn traffic volume at an intersection on the above Circulation Element road is estimated to exceed 300 vehicles at peak hour, an additional 12 feet of right-of-way shall be required for provision of a dual left turn lane. Minimum length of the additional left turn lane shall be 300 feet plus appropriate taper.

**3. Community Collector with raised medians/Boulevards with raised medians**

Where the left turn traffic volume at an intersection on the above Circulation Element road is estimated to exceed 300 vehicles at peak hour, an additional 12 feet of right-of-way shall be required for provision of a dual left turn lane. Minimum length of the additional left turn lane shall be 300 feet plus appropriate taper.

**4. Community Collector without raised medians/Boulevards without raised medians**

Where a the above Circulation Element road intersects another Circulation Element road or where a left turn lane is specified, an additional 14 feet of right-of-way shall be required to provide a left turn lane. Minimum length of the additional left turn lane shall be 250 feet plus appropriate taper.

**5. Rural Collector/Rural Mountain Roads**

Where these roads intersect another Circulation Element road or where a left turn lane is specified, an additional 14 feet of right-of-way shall be required to provide a left turn lane. Minimum length of the additional left turn lane shall be 250 feet plus appropriate taper.

#### 6. Light Collector/Rural Light Collector Roads/Minor Collector

Where these roads intersect another Circulation Element road or where a left turn lane is specified, an additional 14 feet of right-of-way shall be required to provide a left turn lane. Minimum length of the additional left turn lane shall be 200 feet plus appropriate taper.

##### D. Boulevards

Boulevards are four-lane roads with a wider parkway width (14 feet) that may be most suitable in village and town center areas with a high demand for pedestrian travel or rural areas with steep topography.

##### E. Town Collector Roads

Town collector roads are two lane divided roads to control access and turning movements in commercial or higher density residential areas. These roads are appropriate only in villages and rural villages and other multi-residential and commercial areas as determined by the Director or by the Board of Supervisors. This determination may be based upon existing and/or future traffic volumes, the number of existing and/or future access points (such as driveways and private streets), length of road and other similar factors.

##### F. Community Collector

Community Collectors are two-lane roads with variable right-of-way and improvement widths, as specified in Table 2A. Variations for the Community Collector include the provision of raised medians, continuous two-way left turn lanes, intermittent turn lanes, passing lanes and undivided two lanes roads. A right-of-way width of up to 84 feet may be obtained and may be most suitable for two-lane State highways where future passing lanes may be provided.

##### G Minor Collector

Minor Collectors are two-lane roads with variable right-of-way and improvement widths, as specified in Table 2A. Minimum median, shoulder and parkway widths are identified in Table 2A. Variations for the Minor Collector include the provision of raised medians, intermittent turn lanes, passing lanes and undivided two lanes roads. A wider right-of-way width of up to 82 feet may be obtained with an increased parkway width of 14 feet. The wider parkway width may be utilized in rural areas to improve visibility, improve tight curves and/or grade slopes. In villages and town centers the wider parkway may be utilized for landscape buffers and/or to enhance pedestrian and bicycle circulation.

##### H. Rural Collector and Rural Mountain Roads

Rural Collector and Rural Mountain roads are two lanes undivided roads preserving right-of-way of 84 feet and 100 feet respectively with additional right-of-way required at intersections. These roads are appropriate only in rural mountain areas with unique scenic and historic resources.

A Rural Collector road, or a Rural Mountain road, shall be designed with the traveled way placed within the right-of-way so as to minimize the physical impact on the terrain, vegetation, scenic features, and

wildlife habitats. A developer shall construct, in accordance with standard drawings, any required dikes or curbs and gutters, and a minimum of 40 feet of pavement width. Where Rural Collector roads or Rural Mountain roads abut property zoned commercial, industrial, or multiple residential, appropriate commercial or industrial standards shall be constructed by the developer.

#### I. Recreational Parkway

Recreational Parkway is a road which serves rural recreational traffic. Such a road is to be designed for pleasure travel in keeping with the rural or recreational setting that it traverses and serves.

Recreational Parkways shall be designed and improved as follows:

1. Right-of-way width for a Recreational Parkway shall be a minimum of 100 feet, except where such a road is included in a publicly-owned recreational facility the right-of-way width will be adjusted to include only the roadbed width plus appurtenant facilities.
2. The pavement width shall be a minimum of 40 feet. When travel in opposite directions is to be separated to accommodate terrain or other important natural features, the surfaced traveled way shall be a minimum width of 24 feet for each direction.

Increased pavement widths will be required in such cases where the Director finds that such an increase is necessary to provide for the safe and free flow of traffic to enhance the recreational and pleasure driving aspects of the Recreational Parkway.

3. View site parking and roadside stopping areas shall be an integral part of the design and function of a Recreational Parkway. Where appropriate, paved roadside stopping areas with parking shall be provided. Proposed parking and roadside stopping areas shall have been reviewed and approved by each appropriate public agency when such Recreational Parkway traverses a recreational facility possessed by such public agency.

#### J. Interim Road

Standards for this classification of road are specified in Table 2A, Note 10. The exception to the standard is at intersections. A 40-foot pavement width instead of 28-foot pavement width will be required along the road and shall extend a minimum of 200 feet with appropriate taper in each direction from the centerline of the street intersection. Appropriate graded width shall be provided. Interim roads larger than 28 ft. A.C. within 40 ft. graded roadbed may be required if the anticipated traffic volumes are greater than can be safely accommodated on the minimum size road.

## **Section 4.5 NON-CIRCULATION ELEMENT ROADS**

### **A. Residential Collector Road**

A residential collector road is provided to collect local traffic from adjacent residential lots. Such roads are not envisioned as providing for through traffic generating in one community and destined for another. They are designed to accommodate local traffic volumes of between 1,500 and 4,500 average daily trips. A residential collector shall be provided as follows:

1. Right-of-way width shall be 60 feet.
2. Pavement width between the curb faces shall be 40 feet.
3. Knuckles may not be used.

### **B. Rural Residential Collector**

A rural residential collector is intended to serve an area with lot sizes of 2 acres or more where there is little demand for on-street parking. A rural residential collector road is provided to collect local traffic from adjacent residential lots. Such roads are not envisioned as providing for through traffic generating in one community and destined for another. They are designed to accommodate local traffic volumes of between 1,500 and 4,500 average daily trips. A rural residential collector shall be provided as follows:

1. Right-of-way width shall be 48 feet.
2. Pavement width between the curb faces shall be 28 feet.
3. On-street parking is prohibited.
4. Knuckles may not be used.

### **C. Residential Road**

A residential road shall provide access to the residential lots it passes by and abuts. It is not to be used in those instances where a road may be expected to serve in the future as a residential collector road. This road shall be used in those instances where the projected average daily vehicular traffic is not expected to exceed 1,500 trips. A residential road shall be provided as follows:

1. Right-of-way width shall be 56 feet.
2. Pavement width between the curb faces shall be 36 feet.
3. Knuckles may be used following the criteria shown on the County Standard Drawing.

4. Residential roads which are temporarily dead-ended shall end in a temporary cul-de-sac as shown on the County Standard Drawings unless the length is 200 feet or less, in which case no temporary cul-de-sac will be required.

**D. Rural Residential Road**

A rural residential road is intended to serve an area with lot sizes of 2 acres or more where there is little demand for on-street parking. A rural residential road shall provide access to the residential lots it passes by and abuts. It is not to be used in those instances where a road may be expected to serve in the future as a residential collector road. This road shall be used in those instances where the projected average daily vehicular traffic is not expected to exceed 1,500 trips. A residential road shall be provided as follows:

1. Right-of-way width shall be 48 feet.
2. Pavement width between the curb faces shall be 28 feet.
3. On-street parking is prohibited.
4. Knuckles may be used following the criteria shown on the County Standard Drawings.
5. Residential roads which are temporarily dead-ended shall end in a temporary cul-de-sac as shown on the County Standard Drawings unless the length is 200 feet or less, in which case no temporary cul-de-sac will be required.

**E. Residential Cul-De-Sac Road**

A residential cul-de-sac is a dead-end road which provides access to adjacent residential lots. Residential cul-de-sac roads are to provide vehicular access where the projected average daily vehicular trips are below 400. Residential cul-de-sacs roads shall be provided as follows:

1. Right-of-way width shall be 52 feet.
2. Pavement width between the curb faces shall be 32 feet.
3. Minimum radius of the cul-de-sac shall be 38 feet to curb within a 48 foot radius of right-of-way.
4. Knuckles may be used following the criteria shown on the County Standard Drawing.
- 5 Residential cul-de-sacs roads are not to exceed 600 feet in length.

**F. Residential Loop Road**

A residential loop road is a local purpose road which is to accommodate a maximum of 200 projected average daily vehicular trips. Residential loop roads shall be provided as follows:

1. Right-of-way width shall be 52 feet.

2. Pavement width between the curb faces shall be 32 feet.
3. Knuckles may be used following the criteria shown on the County Standard Drawing.
5. Loop roads in excess of 600 feet shall be constructed to residential or residential collector standards in accordance with projected average daily vehicle trips.

G. Industrial/Commercial Collector Road

This road shall provide access to abutting lots zoned for industrial or commercial purposes and also collect traffic from intersecting industrial roads, commercial roads, or collector roads, or roads which provide access to property which has an area of more than five acres and is zoned for commercial purposes, or which will be required to carry more than 4,500 average daily vehicular trips. Industrial/Commercial collector roads shall be provided as follows:

1. Right-of-way width shall be 88 feet.
2. Pavement width between the curb faces shall be 68 feet.
3. Knuckles may not be used.

H. Industrial/Commercial Road

This road shall provide access to abutting industrial/commercial lots where the projected average daily vehicular trips are less than 4,500. Industrial/Commercial roads shall be provided as follows:

1. Right-of-way width shall be 72 feet.
2. Pavement width between the curb faces shall be 52 feet.
3. Knuckles may be used following the criteria shown on the County Standard Drawing.

I. Industrial/Commercial Loop Road

An industrial/commercial loop road may be used in those instances where the projected average daily vehicular trips are less than 4,500. Industrial/Commercial loop roads shall be provided as follows:

1. Right-of-way width shall be 72 feet.
2. Pavement width between the curb faces shall be 52 feet.
3. Knuckles may be used following the criteria shown on the County Standard Drawing.

J. Industrial/Commercial Cul-De-Sac Road

An industrial/commercial cul-de-sac is a dead-end road which terminates in a cul-de-sac and provides access to abutting lots zoned for industrial or commercial purposes. Industrial/Commercial cul-de-sacs shall be used where the projected average daily vehicular trips do not exceed 1,000. Industrial/Commercial cul-de-sac roads shall be provided as follows:

1. Right-of-way width shall be 72 feet.
2. Pavement width between the curb faces shall be 52 feet.
3. The maximum length shall be 1,200 feet.
4. The cul-de-sac shall have a minimum 60 feet property line radius.
5. The cul-de-sac shall be paved to a radius of 50 feet.
6. Knuckles may be used following the criteria shown on the County Standard Drawing.

**K. Half-Width Road (Boundary Road)**

This road classification is for a road lying along a subdivision boundary for which only part of the right-of-way is to be presently dedicated and improved.

1. Right-of-Way
  - a. When the half-width road is a residential street, residential collector road, industrial road, or commercial road, the minimum right-of-way width shall be 40 feet. In addition, the half-width road shall have a one-foot strip of land adjacent to and along the project boundary to which the access rights shall be waived.
  - b. For all other roads, minimum right-of-way width for the half-width road shall be 40 feet or one-half of the ultimate right-of-way width, whichever is greater. In addition, the half-width road shall have a one-foot strip of land adjacent to and along the project boundary to which access rights shall be waived.
2. Surfaced roadbed shall be 28 feet in width, or one-half of the surfaced improvement that would be required for the development of the road at its ultimate width, whichever is greater.

**L. Frontage Road**

A frontage road is a road which is auxiliary to and located adjacent to a railroad, freeway, major highway, or arterial street, and which provides service to abutting property and adjacent areas and provides access control to the adjacent facility. A frontage road may be of any classification.

1. Right-of-way for the frontage road shall equal the standard right-of-way for whatever classification the frontage road is, less 4 to 10 feet, but in no event shall it be less than 52 feet.

2. Pavement width of the frontage road shall be equal to the improved width for whatever classification the frontage road is, less one 8 foot shoulder, but in no event shall the pavement width be less than 28 feet.

M. Alley

1. No new alleys shall be accepted into the County's maintained road system.
2. Alleys are to be privately maintained.
3. Existing alleys shall be as follows:
  - a. Right-of-way shall be a minimum of 20 feet and a maximum of 30 feet in width.
  - b. The intersection of an existing alley with a road shall provide adequate sight distance.
  - c. Alleys shall not intersect.
  - d. Pavement width shall be the full width of the right-of-way, except at intersections of roads, where curb returns with radii equal to the curb-to-property-line dimension shall be constructed.
  - e. Pavement for alleys shall be portland cement concrete (P.C.C.).

N. Interim Road

Standards for this classification of road are specified in Table 2B, Note 6. The exception to the standard is at intersections. A 40-foot pavement width instead of 28-foot pavement width will be required along the road and shall extend a minimum of 200 feet with appropriate taper in each direction from the centerline of the street intersection. Appropriate graded width shall be provided. Interim roads larger than 28 ft. A.C. within 40 ft. graded roadbed may be required if the anticipated traffic volumes are greater than can be safely accommodated on the minimum size road.

O. Split-Level Road

A split-level road is a road of any classification providing the improvements and capacity provided in a normal road of the same classification but with each direction of traffic provided for at different elevations and separated by a median. Right-of-way shall be as follows:

1. The typical right-of-way section for a split-level road shall provide for the same parkway strip, parking lanes, traveled way, and turning lane area required for a normal road of the same classification and, in addition, shall provide:
  - a. A shoulder, at least two feet in width, along the median (edge nearest centerline) of the lower roadway.

- b. A strip at least four feet in width along the median edge of the upper roadway. In this strip the concrete curb or asphalt concrete dike, or approved barrier, shall be installed in those locations where they are required. Guardrail and/or retaining wall shall be required on the median side of the upper roadway when the difference in road level elevation exceeds 10 feet
- c. An additional width sufficient to permit construction of the cut or fill slope without exceeding the safe slope angle determined from soil tests. In the case of vertical or near vertical cuts in rock material, an approved barrier shall be required on the median side of upper roadway. A shoulder at least 10 feet wide or an approach barrier shall be required on the median side of the lower roadway.

2. The width of the dedicated right-of-way shall not be less than the sum of the foregoing widths.

**P. Hillside Residential Street**

To encourage the orderly development of steep areas, certain deviations from the normal standards for subdivision streets will be permitted as shown on County Design Standard Drawings or as specified herein.

The narrower roadway sections provided in the hillside standards outlined below for category 1 hillside standards and category 2 hillside standards have a reduced capacity for traffic and on-road parking. Their use is therefore limited to residential roads in areas where the natural slope exceeds 15 percent and where at least 80 percent of the lots have a net area of not less than 20,000 square feet.

- 1. Category 1 hillside standards are identified as applying to those areas where the natural slope is between 15 and 20 percent.

The method of determining the percent slope for a category 1 hillside development is as follows:

- a. Tabulate the cross-sections with slopes which are less than 15 percent or less.
  - b. Tabulate the cross-sections with slopes which are 15 percent or greater but less than 20 percent.
  - c. Add the lengths ( $L_1$ ) for cross-sections computed in a. above.
  - d. Add the lengths ( $L_2$ ) for cross-sections computed in b. above.
  - e. Perform calculation:  $L_2 - (L_1 + L_2) \times 100 = "X"$  percent.
  - f. If the "X" is 50 or greater, this meets category 1 hillside standards.
- 2. Category 2 hillside standards are identified as applying to those areas where the natural slope exceeds 20 percent.

The method of determining the percent slope for a category 2 hillside development is as follows:

- a. Tabulate the cross-sections with slopes which are 20 percent or less.
  - b. Tabulate the cross-sections with slopes which are greater than 20 percent.
  - c. Add the lengths ( $L_1$ ) for cross-sections computed in a. above.
  - d. Add the lengths ( $L_2$ ) for cross-sections computed in b. above.
  - e. Perform calculation:  $L_2 - (L_1 + L_2) \times 100 = "X"$  percent.
  - f. If the "X" is 50 or greater, this meets category 2 hillside standards.
3. Calculation comments for 1 and 2 above are as follows:
- a. Cross-sections shall be taken normal to the contour lines.
  - b. The cross-sections shall be taken at uniform 50-foot intervals.
  - c. Width of cross-sections shall be the limits of the proposed grading.
  - d. Only one set of standards will be used for a road between intersections.
4. Category 1 hillside standards are as follows:
- a. Permissible street grades shall be increased to maximum of 20 percent grade.
  - b. The graded road width may be reduced a maximum of 5 feet in either or both parkway areas.
  - c. Street grades in excess of 15 percent shall not exceed 600 feet in length.
5. Category 2 hillside standards will allow utilization of any of the alternatives set forth as follows:
- a. Hillside residential two-way street alternatives 1, 2 and 3 are shown on County Design Standard Drawings.
  - b. Minimum right-of-way for hillside streets is shown on the County Design Standard Drawings. Additional slope rights may be required to accommodate a particular situation.
  - c. Hillside residential one-way street:
    - (1) A section providing one 14-foot driving lane and one continuous 8-foot parking lane.
    - (2) Minimum pavement width shall be 22 feet curb to curb.

- (3) Minimum graded area shall be 30 feet wide.
  - (4) Minimum right-of-way shall be 38 feet wide.
  - (5) Maximum length between connections to crossing two-way streets shall be 1,200 feet.
  - (6) Where one-way streets are allowed, street pattern shall provide for return to point of origin in less than one mile.
- d. Hillside residential streets that require a cul-de-sac shall be designed and improved by the developer in accordance with this section and the following:
- (1) The minimum property line radius for the turning circle shall be 40 feet.
  - (2) The turning circle shall be paved to a radius of at least 30 feet.
- e. Minimum horizontal curve radius shall be sufficient to provide a safe speed of at least twenty-five miles per hour in accordance with the current applicable section or figure of the Highway Design Manual of Instructions. On minimum or near-minimum curves, pavement widening shall be provided in accordance with the current applicable section or figure of the Highway Design Manual of Instructions.
7. Where a hillside residential street is authorized to serve a development meeting the definition of a residence district, Section 5.2 will be modified to provide for a 5-foot wide concrete sidewalk, concrete curb and gutter, and a two-foot wide graded area outside of the edge of the sidewalk.

## **SECTION 6**

### **DESIGN STANDARDS**

#### **Section 6.1 INTERSECTIONS**

- A. Property line and curb return radii. The values below are provided for the majority of situations:
1. Commercial and Industrial General Plan Areas:
    - a. Curb return radii shall be a minimum of 40 feet.
    - b. Property line radii shall be a minimum of 30 feet.
  2. Other General Plan Areas:
    - a. Curb return radii shall be a minimum of 30 feet.
    - b. Property line radii shall be a minimum of 20 feet.
  3. Special routes identified to accommodate interstate trucks:
    - a. Curb return radii shall be a minimum of 60 feet.
    - b. Property line radii shall be a minimum of 50 feet.
- B. Where the angle of intersection is less than 90 degrees, or where a sight distance problem may be anticipated, an increased property line radius may be required.
- C. Minimum distance between roads entering into other roads shall be as follows:
1. Non-Circulation Element roads entering into other Non-Circulation Element roads shall have their centerlines separated by at least 200 feet.
  2. Non-Circulation Element roads entering into a Circulation Element road shall have their centerlines separated by at least 300 feet.
  3. Circulation Element roads entering into other Circulation Element roads shall have their centerlines separated by at least 600 feet.

- E. The angle between centerlines of intersecting roads shall be as nearly a right angle as possible, but in no case less than 70 degrees or greater than 110 degrees. Where the angle between the centerlines is between 70 and 80 degrees or between 100 and 110 degrees, there shall be required on the acute angle corner of the intersection a taper to accommodate right-hand turning movements. Said taper shall be set back 5 feet at the exiting point of the curb return and extend 40 feet in such a manner as to safely allow completion of the right-hand turning movement.
- F. Sight distance requirements at all intersections shall conform to the intersectional sight distance criteria as provided in Table 5:

**TABLE 5**

**STANDARD CORNER SIGHT  
DISTANCE AT INTERSECTIONS**

Design Speed, MPH	Minimum Corner Intersection Sight Distance in Feet*
60	600
50	500
40	400
30	300
20	200

\*Corner sight distance measured along the direction of travel from a point on the minor road at least 10 feet from the edge of the major road pavement and measured from a height of eye of 3.5 feet on the minor road to a height of object of 4.25 feet on the major road (see County Road Standard Drawings DS-20A and DS-20B). The design speed used to determine the minimum sight distance requirement shall be the greater of the current prevailing speed (if known) and the minimum design speed of the respective road classification shown in Tables 2A and 2B. Additional corner intersection sight distance may be required for left turns at divided highways, left turns onto two-way highways with more than two lanes, or grades which exceed 3 percent, as per "AASHTO A Policy on Design of Highways and Streets".

- G. The maximum grade at any intersection of two streets shall be 6 percent within the intersection and for at least 20 feet beyond the right-of-way of the intersecting street.
- H. Where two road centerlines intersect, the lower classified road is not to intersect the primary road with a curve. Instead, the alignment of the lower classified road must intersect the primary road in a straight line for a length not less than the full width of the primary road's right-of-way.
- I. Prior to the installation of a new traffic signal, traffic signal warrant analysis must be performed. The Californian Manual for Uniform Traffic Control Devices (CA MUTCD) should be consulted for procedures of conducting signal warrant analysis. The design and installation of the traffic signal and pavement markings should also conform to the CA MUTCD.

- J. Roundabouts are also acceptable traffic control devices at intersections. Prior to placement of a roundabout a comprehensive engineering design prepared by a licensed civil engineer experienced in the design and construction of roundabouts must be prepared. A peer review of the roundabout design should also be provided prior to installation of a roundabout on a Circulation Element Road. "Roundabouts: An Informational Guide" published by the Federal Highway Administration should be consulted as a guide in the design of the roundabout. Striping and pavement markings for the roundabout should conform to the CA MUTCD.

## **Section 6.2 FUTURE ROAD EXTENSIONS**

When any road is extended to a subdivision boundary for the purpose of providing a future connection to adjoining property, the subdivider shall submit an alignment and profile demonstrating the feasibility of such future extension.

The demonstration shall include a provision of acceptable sight distance for any intersecting street shown on the plan which is within the design sight distance of the subdivision boundary. Such demonstration shall also extend for a distance of  $\frac{1}{4}$  mile from the subdivision boundary or longer if specific circumstances so dictate.

## **Section 6.3 GRADING**

- A. Roads shall be graded by the developer to full width of right-of-way with the following exceptions:
1. For Rural Collectors and Rural Mountain Roads, full grading may be required depending on expected ultimate traffic and/or special findings.
  2. Grading for Recreational Parkways shall be minimized wherever possible. All embankments shall be contour graded to blend into the natural terrain and cut slopes are to be rounded. Graded slopes shall be as flat as possible and shall be planted in accordance with the surrounding natural flora.
  3. The Director shall have the authority to modify full width grading requirements in areas where such modification would not compromise driver, cyclist, or pedestrian or equestrian safety or in any way be detrimental to the public. In any such case, slope rights for future grading and drainage facilities shall be dedicated.

This requirement shall apply to all Circulation Element roads and to all other roads where the County has a legal interest (fee, road easement, rejected offer of dedication, irrevocable offer of dedication) or where improvement plans are required as a condition of approval of acceptance of the project.

- B. Grading or excavating in an existing County road right-of-way shall not be permitted unless authorized by a valid permit.
- C. Where required improvements extend beyond the public right-of-way and onto private land, the entity to provide such improvements shall acquire legal permission to trespass and construct the improvements. Permission is identified as a temporary construction easement or a letter signed by the owner of the private land or other documents acceptable to the Department of Public Works.

## SANDAG's Trip Generation Rates

(NOT SO)

# BRIEF GUIDE OF VEHICULAR TRAFFIC GENERATION RATES FOR THE SAN DIEGO REGION

APRIL 2002



401 B Street, Suite 800  
San Diego, California 92101  
(619) 699-1900 • Fax (619) 699-1950

NOTE: This listing only represents a *guide* of average, or estimated, traffic generation "driveway" rates and some very general trip data for land uses (emphasis on acreage and building square footage) in the San Diego region. These rates (both local and national) are subject to change as future documentation becomes available, or as regional sources are updated. For more specific information regarding traffic data and trip rates, please refer to the San Diego Traffic Generators manual. *Always check with local jurisdictions for their preferred or applicable rates.*

LAND USE	TRIP CATEGORIES (PRIMARY:DIVERTED:PASS-BY) <sup>1</sup>	ESTIMATED WEEKDAY VEHICLE TRIP GENERATION RATE (DRIVEWAY)	HIGHEST PEAK HOUR % (plus IN:OUT ratio)		TRIP LENGTH (Miles) <sup>2</sup>
			Between 6:00-9:30 A.M.	Between 3:00-6:30 P.M.	
AGRICULTURE (Open Space)	[80:18:2]	2/acre**			10.8
AIRPORT	[78:20:2]				12.5
Commercial		60/acre, 100/flight, 70/1000 sq. ft. * **	5% (6:4)	6% (5:5)	
General Aviation		6/acre, 2/flight, 6/based aircraft * **	9% (7:3)	15% (5:5)	
Heliports		100/acre**			
AUTOMOBILE <sup>3</sup>					
Car Wash					
Automatic		900/site, 600/acre**	4% (5:5)	9% (5:5)	
Self-serve		100/wash stall**	4% (5:5)	6% (5:5)	
Gasoline	[21:51:28]				2.8
with/Food Mart		160/vehicle fueling space**	7% (5:5)	8% (5:5)	
with/Food Mart & Car Wash		155/vehicle fueling space**	8% (5:5)	9% (5:5)	
Older Service Station Design		150/vehicle fueling space, 900/station**	7% (5:5)	9% (5:5)	
Sales (Dealer & Repair)		50/1000 sq. ft., 300/acre, 60/service stall* **	5% (7:3)	8% (4:6)	
Auto Repair Center		20/1000 sq. ft., 400/acre, 20/service stall*	8% (7:3)	11% (4:6)	
Auto Parts Sales		60/1000 sq. ft. *	4%	10%	
Quick Lube		40/service stall**	7% (6:4)	10% (5:5)	
Tire Store		25/1000 sq. ft., 30/service stall**	7% (6:4)	11% (5:5)	
CEMETERY		5/acre*			
CHURCH (or Synagogue)	[64:25:11]	9/1000 sq. ft., 30/acre** (quadruple rates for Sunday, or days of assembly)	5% (6:4)	8% (5:5)	5.1
COMMERCIAL/RETAIL <sup>3</sup>					
Super Regional Shopping Center (More than 80 acres, more than 800,000 sq. ft., w/usually 3 + major stores)		35/1000 sq. ft., <sup>c</sup> 400/acre*	4% (7:3)	10% (5:5)	
Regional Shopping Center (40-80 acres, 400,000-800,000 sq. ft., w/usually 2 + major stores)	[54:35:11]	50/1000 sq. ft., <sup>c</sup> 500/acre*	4% (7:3)	9% (5:5)	5.2
Community Shopping Center (15-40 acres, 125,000-400,000 sq. ft., w/usually 1 major store, detached restaurant(s), grocery and drugstore)	[47:31:22]	80/1000 sq. ft., 700/acre* **	4% (6:4)	10% (5:5)	3.6
Neighborhood Shopping Center (Less than 15 acres, less than 125,000 sq. ft., w/usually grocery & drugstore, cleaners, beauty & barber shop, & fast food services)		120/1000 sq. ft., 1200/acre* **	4% (6:4)	10% (5:5)	
Commercial Shops	[45:40:15]				4.3
Specialty Retail/Strip Commercial		40/1000 sq. ft., 400/acre*	3% (6:4)	9% (5:5)	
Electronics Superstore		50/1000 sq. ft.**		10% (5:5)	
Factory Outlet		40/1000 sq. ft.**	3% (7:3)	9% (5:5)	
Supermarket		150/1000 sq. ft., 2000/acre* **	4% (7:3)	10% (5:5)	
Drugstore		90/1000 sq. ft.**	4% (6:4)	10% (5:5)	
Convenience Market (15-16 hours)		500/1000 sq. ft.**	8% (5:5)	8% (5:5)	
Convenience Market (24 hours)		700/1000 sq. ft.**	8% (5:5)	7% (5:5)	
Convenience Market (w/gasoline pumps)		850/1000 sq. ft., 550/vehicle fueling space**	8% (5:5)	7% (5:5)	
Discount Club		60/1000 sq. ft., 600/acre* **	1% (7:3)	9% (5:5)	
Discount Store		60/1000 sq. ft., 600/acre**	3% (6:4)	8% (5:5)	
Furniture Store		6/1000 sq. ft., 100/acre**	4% (7:3)	9% (5:5)	
Lumber Store		30/1000 sq. ft., 150/acre**	7% (6:4)	9% (5:5)	
Home Improvement Superstore		40/1000 sq. ft.**	5% (6:4)	8% (5:5)	
Hardware/Paint Store		60/1000 sq. ft., 600/acre**	2% (6:4)	9% (5:5)	
Garden Nursery		40/1000 sq. ft., 90/acre**	3% (6:4)	10% (5:5)	
Mixed Use: Commercial (w/supermarket)/Residential		110/1000 sq. ft., 2000/acre* (commercial only) 5/dwelling unit, 200/acre* (residential only)	3% (6:4) 9% (3:7)	9% (5:5) 13% (6:4)	
EDUCATION					
University (4 years)	[91:9:0]	2.4/student, 100 acre*	10% (8:2)	9% (3:7)	8.9
Junior College (2 years)	[92:7:1]	1.2/student, 24/1000 sq. ft., 120/acre* **	12% (8:2)	9% (6:4)	9.0
High School	[75:19:6]	1.3/student, 15/1000 sq. ft., 60/acre* **	20% (7:3)	10% (4:6)	4.8
Middle/Junior High	[63:25:12]	1.4/student, 12/1000 sq. ft. 50/acre* **	30% (6:4)	9% (4:6)	5.0
Elementary	[57:25:10]	1.6/student, 14/1000 sq. ft., 90/acre* **	32% (6:4)	9% (4:6)	3.4
Day Care	[28:58:14]	5/child, 80/1000 sq. ft.**	17% (5:5)	18% (5:5)	3.7
FINANCIAL <sup>3</sup>	[35:42:23]				3.4
Bank (Walk-In only)		150/1000 sq. ft., 1000/acre* **	4% (7:3)	8% (4:6)	
with Drive-Through		200/1000 sq. ft., 1500/acre*	5% (6:4)	10% (5:5)	
Drive-Through only		250 (125 one-way)/lane*	3% (5:5)	13% (5:5)	
Savings & Loan		60/1000 sq. ft., 600/acre**	2%	9%	
Drive-Through only		100 (50 one-way)/lane**	4%	15%	
HOSPITAL	[73:25:2]				8.3
General		20/bed, 25/1000 sq. ft., 250/acre*	8% (7:3)	10% (4:6)	
Convalescent/Nursing		3/bed**	7% (6:4)	7% (4:6)	
INDUSTRIAL					
Industrial/Business Park (commercial included)	[79:19:2]	16/1000 sq. ft., 200/acre* **	12% (8:2)	12% (2:8)	9.0
Industrial Park (no commercial)		8/1000 sq. ft., 90/acre**	11% (9:1)	12% (2:8)	
Industrial Plant (multiple shifts)	[92:5:3]	10/1000 sq. ft., 120/acre*	14% (8:2)	15% (3:7)	11.7
Manufacturing/Assembly		4/1000 sq. ft., 50/acre**	19% (9:1)	20% (2:8)	
Warehousing		5/1000 sq. ft., 60/acre**	13% (7:3)	15% (4:6)	
Storage		2/1000 sq. ft., 0.2/vault, 30/acre*	6% (5:5)	9% (5:5)	
Science Research & Development		8/1000 sq. ft., 80/acre*	16% (9:1)	14% (1:9)	
Landfill & Recycling Center		6/acre	11% (5:5)	10% (4:6)	

(OVER)

MEMBER AGENCIES: Cities of Carlsbad, Chula Vista, Coronado, Del Mar, El Cajon, Encinitas, Escondido, Imperial Beach, La Mesa, Lemon Grove, National City, Oceanside, Poway, San Diego, San Marcos, Santee, Solana Beach, Vista and County of San Diego.

ADVISORY/LIAISON MEMBERS: California Department of Transportation, County Water Authority, U.S. Department of Defense, S.D. Unified Port District and Tijuana/Baja California.

LAND USE	TRIP CATEGORIES (PRIMARY:DIVERTED:PASS-BY)*	ESTIMATED WEEKDAY VEHICLE TRIP GENERATION RATE (DRIVEWAY)	HIGHEST PEAK HOUR % (plus IN:OUT ratio) Between 6:00-9:30 A.M. Between 3:00-6:30 P.M.		TRIP LENGTH (Miles)†
<b>LIBRARY</b> .....	[44:44:12]	50/1000 sq. ft., 400/acre**	2%	(7:3)	3.9
<b>LODGING</b> .....	[58:38:4]				7.6
Hotel (w/convention facilities/restaurant)		10/occupied room, 300/acre	6%	(6:4)	
Motel		9/occupied room, 200/acre*	8%	(4:6)	
Resort Hotel		8/occupied room, 100/acre*	5%	(6:4)	
Business Hotel		7/occupied room**	8%	(4:6)	
<b>MILITARY</b> .....	[82:16:2]	2.5/military & civilian personnel*	9%	(9:1)	11.2
<b>OFFICE</b> .....					
Standard Commercial Office .....	[77:19:4]	20/1000 sq. ft., 300/acre*	14%	(9:1)	8.8
(less than 100,000 sq. ft.)					
Large (High-Rise) Commercial Office .....	[82:15:3]	17/1000 sq. ft., 600/acre*	13%	(9:1)	10.0
(more than 100,000 sq. ft., 6+ stories)					
Office Park (400,000+ sq. ft.)		12/1000 sq. ft., 200/acre**	13%	(9:1)	
Single Tenant Office		14/1000 sq. ft., 180/acre*	15%	(9:1)	8.8
Corporate Headquarters		7/1000 sq. ft., 110/acre*	17%	(9:1)	
Government (Civic Center) .....	[50:34:16]	30/1000 sq. ft., 1*	9%	(9:1)	6.0
Post Office					
Central/Walk-In Only		90/1000 sq. ft.**	5%		7%
Community (not including mail drop lane)		200/1000 sq. ft., 1300/acre*	8%	(6:4)	9% (5:5)
Community (w/mail drop lane)		300/1000 sq. ft., 2000/acre*	7%	(5:5)	10% (5:5)
Mail Drop Lane only		1500 (750 one-way)/lane*	7%	(5:5)	12% (5:5)
Department of Motor Vehicles		180/1000 sq. ft., 900/acre**	6%	(6:4)	10% (4:6)
Medical-Dental .....	[60:30:10]	50/1000 sq. ft., 500/acre*	8%	(8:2)	11% (3:7)
<b>PARKS</b> .....	[66:28:6]		4%		5.4
City (developed w/meeting rooms and sports facilities)		50/acre*	13%	(5:5)	
Regional (developed)		20/acre*			
Neighborhood/County (undeveloped)		5/acre (add for specific sport uses), 6/picnic site**			
State (average 1000 acres)		1/acre, 10/picnic site**			
Amusement (Theme)		80/acre, 130/acre (summer only)**		8%	(6:4)
San Diego Zoo		115/acre*			
Sea World		60/acre*			
<b>RECREATION</b> .....					
Beach, Ocean or Bay .....	[52:39:9]	600/1000 ft. shoreline, 60/acre*			6.3
Beach, Lake (fresh water)		50/1000 ft. shoreline, 5/acre*			
Bowling Center		30/1000 sq. ft., 300/acre, 30/lane**	7%	(7:3)	11% (4:6)
Campground		4/campsite**	4%		8%
Golf Course		7/acre, 40/tee, 700/course**	7%	(8:2)	9% (3:7)
Driving Range only		70/acre, 14/tee box*	3%	(7:3)	9% (5:5)
Marinas		4/berth, 20/acre**	3%	(3:7)	7% (6:4)
Multi-purpose (miniature golf, video arcade, batting cage, etc.)		90/acre	2%		6%
Racquetball/Health Club		30/1000 sq. ft., 300/acre, 40/court*	4%	(6:4)	9% (6:4)
Tennis Courts		16/acre, 30/court**	5%		11% (5:5)
Sports Facilities					
Outdoor Stadium		50/acre, 0.2/seat*			
Indoor Arena		30/acre, 0.1/seat*			
Racetrack		40/acre, 0.6/seat*			
Theaters (multiplex w/matinee) .....	[66:17:17]	80/1000 sq. ft., 1.8/seat, 360/screen*	1/3%		8%
<b>RESIDENTIAL</b> .....	[86:11:3]				7.9
Estate, Urban or Rural		12/dwelling unit**	8%	(3:7)	10%
(average 1-2 DU/acre)					(7:3)
Single Family Detached		10/dwelling unit**	8%	(3:7)	10%
(average 3-6 DU/acre)					(7:3)
Condominium		8/dwelling unit**	8%	(2:8)	10%
(or any multi-family 6-20 DU/acre)					(7:3)
Apartment		6/dwelling unit**	8%	(2:8)	9%
(or any multi-family units more than 20 DU/acre)					(7:3)
Military Housing (off-base, multi-family)					
(less than 6 DU/acre)		8/dwelling unit	7%	(3:7)	9%
(6-20 DU/acre)		6/dwelling unit	7%	(3:7)	9%
Mobile Home					
Family		5/dwelling unit, 40/acre*	8%	(3:7)	11%
Adults Only		3/dwelling unit, 20/acre*	5%	(3:7)	10%
Retirement Community		4/dwelling unit**	5%	(4:6)	7%
Congregate Care Facility		2.5/dwelling unit**	4%	(6:4)	8%
<b>RESTAURANT*</b> .....	[51:37:12]				4.7
Quality		100/1000 sq. ft., 3/seat, 500/acre**	1%	(6:4)	8%
Sit-down, high turnover		160/1000 sq. ft., 8/seat, 1000/acre**	8%	(5:5)	8%
Fast Food (w/drive-through)		650/1000 sq. ft., 20/seat, 3000/acre**	7%	(5:5)	7%
Fast Food (without drive-through)		700/1000 sq. ft.**	5%	(6:4)	7%
Delicatessen (7am-4pm)		150/1000 sq. ft., 11/seat*	9%	(6:4)	3%
<b>TRANSPORTATION</b> .....					
Bus Depot		25/1000 sq. ft.**			
Truck Terminal		10/1000 sq. ft., 7/bay, 80/acre**	9%	(4:6)	8%
Waterport/Marine Terminal		170/berth, 12/acre**			(5:5)
Transit Station (Light Rail w/parking)		300/acre, 2 1/2/parking space (4/occupied)**	14%	(7:3)	15%
Park & Ride Lots		400/acre (600/paved acre),	14%	(7:3)	15%
		5/parking space (8/occupied)**			(3:7)

\* Primary source: San Diego Traffic Generators.

\* Other sources: ITE Trip Generation Report (8th Edition), Trip Generation Rates (other agencies and publications), various SANDAG & CALTRANS studies, reports and estimates.

\* Trip category percentage ratios are daily from local household surveys, often cannot be applied to very specific land uses, and do not include non-resident drivers

(draft SANDAG Analysis of Trip Diversion, revised November, 1990).

PRIMARY - one trip directly between origin and primary destination.

DIVERTED - linked trip (having one or more stops along the way to a primary destination) whose distance compared to direct distance  $\geq 1$  mile.

PASS-BY - undiverted or diverted < 1 mile.

† Trip lengths are average weighted for all trips to and from general land use site. (All trips system-wide average length = 6.9 miles)

\* Fitted curve equation:  $\ln(T) = 0.502 \ln(d) + 6.945$  } T = total trips, x = 1,000 sq. ft.

\* Fitted curve equation:  $\ln(T) = 0.756 \ln(d) + 3.950$  }

\* Fitted curve equation:  $t = -2.169 \ln(d) + 12.85$  } t = trips/DU, d = density (DU/acre), DU = dwelling unit

\* Suggested PASS-BY (undiverted or diverted < 1 mile) percentages for trip rate reductions only during P.M. peak period (based on combination of local data/review and other sources\*\*):

COMMERCIAL/RETAIL	
Regional Shopping Center	20%
Community	30%
Neighborhood	40%
Specialty Retail/Strip Commercial (other)	10%
Supermarket	40%
Convenience Market	50%
Discount Club/Store	30%
FINANCIAL	
Bank	25%
AUTOMOBILE	
Gasoline Station	50%
RESTAURANT	
Quality	10%
Sit-down/high turnover	20%
Fast Food	40%

\* Trip Reductions - In order to help promote regional "smart growth" policies, and acknowledge San Diego's expanding mass transit system, consider vehicle trip rate reductions (with proper documentation and necessary adjustments for peak periods). The following are some examples:

[1] A 5% daily trip reduction for land uses with transit access or near transit stations accessible within 1/4 mile.

[2] Up to 10% daily trip reduction for mixed-use developments where residential and commercial retail are combined (demonstrate mode split of walking trips to replace vehicular trips).

Excerpts from County's Guidelines for Determining Significance

**COUNTY OF SAN DIEGO**

**GUIDELINES FOR DETERMINING SIGNIFICANCE**  
**AND**  
**REPORT FORMAT AND CONTENT REQUIREMENTS**

**TRANSPORTATION AND TRAFFIC**



**LAND USE AND ENVIRONMENT GROUP**

**Department of Planning and Land Use**  
**Department of Public Works**

**Second Revision**  
**June 30, 2009**

**Second Modification**  
**August 24, 2011**

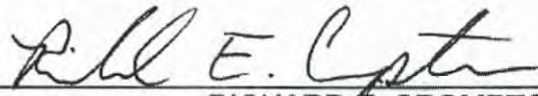
## APPROVAL

I hereby certify that these **Guidelines for Determining Significance and Report Format and Content Requirements for Transportation and Traffic** are a part of the County of San Diego, Land Use and Environment Group's Guidelines for Determining Significance and Technical Report Format and Content Requirements and were considered by the Director of Planning and Land Use, in coordination with the Director of Public Works on the 24<sup>th</sup> day of August, 2011.



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Director of Planning and Land Use



RICHARD E. CROMPTON

Director of Public Works

I hereby certify that these **Guidelines for Determining Significance and Report Format and Content Requirements for Transportation and Traffic** are a part of the County of San Diego, Land Use and Environment Group's Guidelines for Determining Significance and Technical Report Format and Content Requirements and have hereby been approved by the Deputy Chief Administrative Officer (DCAO) of the Land Use and Environment Group on the 24<sup>th</sup> day of August, 2011. The Director of Planning and Land Use is authorized to approve revisions to these Guidelines for Determining Significance and Report Format and Content Requirements for Transportation and Traffic, except any revisions to Section 4.0 of the Guidelines for Determining Significance for Transportation and Traffic must be approved by the Deputy CAO.

Second Modification  
August 24, 2011

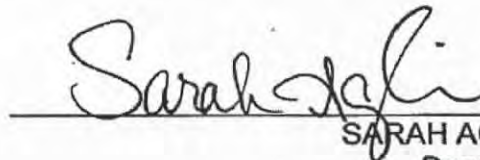
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First Modification  
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December 5, 2007

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**COUNTY OF SAN DIEGO**  
**GUIDELINES FOR DETERMINING SIGNIFICANCE**  
**TRANSPORTATION AND TRAFFIC**



**LAND USE AND ENVIRONMENT GROUP**

**Department of Planning and Land Use**  
**Department of Public Works**

**Second Revision**  
**June 30, 2009**

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**August 24, 2011**

## EXPLANATION

These Guidelines for Determining Significance for Transportation and Traffic and information presented herein shall be used by County staff in their review of discretionary projects and environmental documents pursuant to the California Environmental Quality Act (CEQA). These Guidelines present a range of quantitative, qualitative, and performance levels for particular environmental effects. Normally, (in the absence of substantial evidence to the contrary), non-compliance with a particular standard stated in these Guidelines will usually mean the project will result in a significant effect, whereas compliance will normally mean the effect will be determined to be "less than significant." Section 15064(b) of the State CEQA Guidelines states:

"The determination whether a project may have a significant effect on the environment calls for careful judgment on the part of the public agency involved, based to the extent possible on factual and scientific data. An ironclad definition of significant effect is not always possible because the significance of an activity may vary with the setting."

These Guidelines assist in providing a consistent, objective and predictable evaluation of significant effects. These Guidelines are not binding on any decision-maker and should not be substituted for the use of independent judgment to determine significance or the evaluation of evidence in the record. The County reserves the right to request further, project specific, information in its evaluation of a project's environmental effects and to modify these Guidelines in the event a scientific discovery or factual data alters the common application of a Guideline. In addition, evaluations to verify the applicability of the significance guidelines for individual project conditions may be necessary. Additional evaluations may include analysis of vehicle headways, speeds, average gaps, queues, delay, or other factors.

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### List of Acronyms

ADT	Average Daily Trips
CALTRANS	California Department of Transportation
CEQA	California Environmental Quality Act
CMP	Congestion Management Plan
DPLU	Department of Planning and Land Use
HCM	Highway Capacity Manual
ITE	Institute of Traffic Engineers
LOS	Level of Service
min	Minute
mph	Miles per Hour
MTDB	Metropolitan Transit Development Board
NCTD	North San Diego County Transit District
PFE	Public Facilities Element
RTP	Regional Transportation Plan
SANDAG	San Diego Association of Governments
SANTEC	San Diego Traffic Engineers' Council
sec	Second
TIS	Traffic Impact Study
V/C	Volume to Capacity
VMT	Vehicle Miles Traveled

## INTRODUCTION

This document provides guidance for evaluating adverse environmental effects that a proposed project may have on transportation and traffic. Specifically, this document addresses the following questions listed in the California Environmental Quality Act (CEQA) Guidelines, Appendix G, XV, Transportation/Traffic<sup>1</sup>:

Would the project:

- a) Conflict with an applicable plan, ordinance or policy establishing measures of the effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths and mass transit?
- b) Conflict with an applicable congestion management program, including but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?
- d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?
- g) Conflict with adopted policies, plans, or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?

Traffic and transportation related impacts are major concerns for the San Diego Region. As population in the San Diego Region grows, traffic, as measured by average daily trips (ADT), also grows. Land development within the San Diego region contributes to growth in population and growth in traffic. The rate of land development, population and traffic growth has often outpaced the provision of needed transportation infrastructure to adequately accommodate the increased growth. As a result, traffic congestion is a common occurrence on many freeways, highways and arterials in the San Diego region.

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<sup>1</sup> The State CEQA Guidelines, Appendix G, XV Transportation/Traffic list two other transportation/traffic related questions (c and e), which are not addressed in this document. Question c states, "Would the project result in a change in air traffic patterns, including either an increase in traffic levels or a change in locations that results in substantial safety risks?" Question c is concerned with airport traffic safety and is addressed under the County's Guidelines for Determining Significance for Airport Hazards. Question e states, "Would the project result in inadequate emergency access?" Question e is addressed under the County's Guidelines for Determining Significance for Fire Protection Planning, which addresses the needs of emergency service providers (fire and sheriff, etc.), including emergency access requirements.

## 1.0 GENERAL PRINCIPLES AND EXISTING CONDITIONS

The population of the San Diego Region is projected to increase from approximately 2.9 million people today to about 3.9 million in the year 2030. As a result, the number of forecasted Vehicle Miles Traveled (VMT) in the San Diego Region is projected to increase 50 percent from current levels. Road improvements will be needed to accommodate the anticipated growth in traffic; otherwise, traffic congestion will increase significantly.

### 1.1 Level of Service

As a means of measuring and evaluating traffic congestion, the concept of "level of service" was created. Level of service (LOS) is a quality of service measure that describes operational conditions on a transportation facility, such as a roadway or intersection. Levels of service are established based upon the driver's perspective. This service measure is a general overall measurement of several conditions such as speed and travel time, freedom to maneuver, traffic interruption, and comfort and convenience. Safety is an important concern but, typically, is not included in the measures that establish service levels.

Six LOS categories are defined for each type of transportation facility. Letters designate each level, from A to F, with LOS A representing the best operating conditions and LOS F the worst. Each LOS represents a range of operating conditions and the driver's perception of those conditions. Methods for identifying levels of service vary based upon the type of transportation facility. Criteria for identifying levels of service on County of San Diego arterials are provided in the County of San Diego Public Road Standards. Methods of identifying levels of service for freeways, highways and intersections are provided in the Highway Capacity Manual (HCM). A detailed discussion of level of service is provided in Attachment A. Also, definitions of some key traffic terms are included in Attachment B.

Levels of service are used primarily to assess how substantial increases in vehicular traffic may affect traffic congestion on specific transportation facilities, such as freeways, arterials, and intersections. Procedures have also been established to adjust the evaluation to account for trucks, buses, grade and pedestrian volumes. Substantial traffic volume increase may also result in other traffic related impacts. Where applicable, evaluations should be made to assess the potential for traffic related impacts for the following items:

- Regional transportation facilities; including freeways, state highways and ramps
- Local circulation and road network
- Adequacy of existing roadway or intersection design features
- Access (both primary and secondary, as required)
- Alternative transportation modes; including pedestrians, bicyclists and transit

## **1.2 Traffic Impact Studies**

In order to evaluate potential traffic impacts that may result from a specific land development or road improvement project, traffic impact studies are often prepared. Traffic impact studies include estimates of the amount of traffic generated by the project, distributions of project traffic or redistributions of traffic caused by the project, assessments of potential traffic impacts, and when applicable, the identification of mitigation measures to alleviate project-related traffic impacts.

The agency responsible for final approval of a project's traffic study is the agency that has discretionary approval of the project. For most projects located in the unincorporated area of San Diego, the agency approving the traffic study would be the County of San Diego. However, coordination with other affected agencies is often necessary in the preparation of traffic impact studies. The San Diego Association of Governments (SANDAG) is the agency responsible for the oversight of regional transportation planning. The California Department of Transportation (Caltrans) is the State agency responsible for planning, constructing and maintaining the State highway network. In addition to the County of San Diego, eighteen other municipalities within the San Diego Region are responsible for planning, constructing and maintaining local transportation networks within their respective areas of jurisdiction.

For more information on Traffic Impact Studies refer to the Transportation and Traffic Report Format and Content Requirements.

## **1.3 Regional Transportation Plan**

On March 28, 2003, the SANDAG Board adopted the 2030 Regional Transportation Plan (RTP) and in February 2005, Amendment Number 1 to the RTP was approved. Mobility 2030 establishes goals and policies for addressing the needs of the regional transportation network in the San Diego region. In addition to identifying highway and road improvements, Mobility 2030 emphasizes Managed/High Occupancy Vehicle (HOV) lanes to accommodate transit services, as well as carpools and vanpools. It also emphasizes the coordination of transportation infrastructure and services with land use planning and focuses on a variety of performance measures, such as average travel times, instead of the traditional level of service measurements.

Under the "reasonably expected revenue" scenario, Mobility 2030 estimates \$42 billion to be available to implement proposed improvements in the plan. Under this scenario, 19% would be provided through the Transnet extension, 28% would be provided by local revenue sources, 33% would be provided by state sources and 20% would come from federal sources. Identified improvements would not focus solely on road improvements, but are expected to increase mobility by making improvements to transit, highways, local street networks, land use systems and demand management systems.

## **2.0 EXISTING REGULATIONS AND STANDARDS**

The following list details the most significant regulations and standards that address traffic and transportation issues in California and the County of San Diego.

### **2.1 State Regulations and Standards**

#### **California Environmental Quality Act (CEQA)<sup>2</sup>**

[[http://ceres.ca.gov/topic/env\\_law/ceqa/guidelines/](http://ceres.ca.gov/topic/env_law/ceqa/guidelines/)]

Under the California Environmental Quality Act (CEQA) lead agencies are required to consider traffic impacts when assessing the environmental impacts of proposed projects. CEQA requires discretionary projects to evaluate the effect projects may have on traffic circulation and other transportation related impacts.

### **2.2 Local Regulations and Standards**

#### **Public Facilities Element (Part XII) of the San Diego County General Plan**

[[http://ceres.ca.gov/planning/counties/San\\_Diego/plans.html](http://ceres.ca.gov/planning/counties/San_Diego/plans.html)]

The County of San Diego General Plan Public Facilities Element establishes policies and implementation measures regarding the assessment and mitigation of traffic impacts of new development. One of the goals of the Public Facilities Element (PFE) is to provide "A safe, convenient, and economical integrated transportation system including a wide range of transportation modes (PFE, page XII-4-18)." The PFE also identifies an objective in the Transportation Section to provide a "Level of Service C or better on County Circulation Element roads. (PFE, page XII-4-18)." The PFE, however, establishes LOS D as an off-site mitigation limit for discretionary projects. When an existing Level of Service is already D, "a LOS of D may be allowed (PFE, page XII-4-18)." According to the PFE, projects that significantly increase congestion on roads operating at LOS E or LOS F must provide mitigation. According to the PFE, this mitigation can consist of a fair share contribution to an established program or project to mitigate the project's impacts. If impacts cannot be mitigated, the project will be denied unless a specific statement of overriding findings is made pursuant to Sections 15091 and 15093 of the State CEQA Guidelines to approve the project as proposed.

#### **San Diego County Transportation Impact Fee (TIF) Program/Ordinance**

[<http://www.sdcountry.ca.gov/dpw/land/tif.html>]

The County of San Diego Board of Supervisors adopted a Transportation Impact Fee Ordinance (April 2005/Updated January 2008) for the unincorporated area of San Diego County. The ordinance enables the County to implement Transportation Impact Fee (TIF) programs. The TIF program requires payment of fees that constitute a proposed project's fair share contribution towards the construction costs of the planned transportation facilities that are affected by the proposed development. The TIF fees are collected as a condition of approval of a subdivision or prior to issuance of a development permit, including and most typically a building permit.

<sup>2</sup> Public Resources Code 21000-21178; California Code of Regulations, Guidelines for Implementation of CEQA, Appendix G, Title 14, Chapter 3, §15000-15387.

The TIF Program provides a mechanism for mitigating the impacts created by future growth within the unincorporated area. The TIF is offered to developers to facilitate compliance with the CEQA mandate that development projects mitigate their indirect, cumulative traffic impacts. The County TIF Program assesses the fee on all new development that results in new/added traffic. The primary purpose of the TIF is twofold: (1) to fund the construction of identified roadway facilities needed to reduce, or mitigate, projected cumulative traffic impacts resulting from future development within the County; and (2) to allocate the costs of these roadway facilities proportionally among future developing properties based upon their individual cumulative traffic impacts.

Cumulative impacts are those impacts caused collectively by all development within the community. Cumulative impacts can result from individually minor, but collectively significant projects taking place over a period of time (CEQA Guidelines §15355). The CEQA Guidelines recognize that mitigation for cumulative impacts may involve the adoption of ordinances or regulations (CEQA Guidelines §15130) such as the County-adopted Transportation Impact Fee Program.

TIF funds are collected into 23 local Community Planning Area accounts, three regional accounts, and three regional freeway ramp accounts. TIF funds are only used to pay for improvements to roadway facilities identified for inclusion in the TIF Program, which include both County roads and Caltrans highway facilities. TIF funds collected for a specific local or regional area must be spent in the same area. For example, the TIF collected in the North Region TIF account may only be used for improvements to TIF facilities in the North Region. By ensuring TIF funds are spent for the specific roadway improvements identified in the TIF Program, the CEQA mitigation requirement is satisfied and the Mitigation Fee Act nexus is met.

As part of the TIF Program process, the transportation infrastructure needs are characterized as one of the following: existing deficiencies; direct impacts of future development; or indirect (cumulative) impacts of future development. Existing roadway deficiencies are the responsibility of existing developed land uses and government agencies, and cannot be financed with impact fees. The TIF Program is not intended to mitigate direct impacts which will continue to be the responsibility of individual development projects. Therefore, the TIF Program is only designed to address the cumulative impacts associated with new growth.

Recognizing that an individual development project is not wholly responsible for cumulative traffic impacts, each development project is required to mitigate in proportion to the project's estimated traffic generation. The County TIF Program enables projects to achieve CEQA compliance by paying a fair share toward the cost of improving roads in the future as the levels of service become unacceptable due to the increased traffic volume caused by the cumulative impacts, of various developments. The County's TIF Program goes into detail in identifying anticipated development, the roads affected, roadway costs, and the existing and projected levels of service on those roads. As

sufficient funds become available, the County will implement the improvements that it has programed.

While contribution to the TIF Program will typically mitigate a project's cumulative impacts within the unincorporated area, certain projects would result in increases in density or intensity beyond the growth projections analyzed in the TIF report. These projects, such as General Plan Amendments, Specific Plan Amendments, Rezones and some Major Use Permits, may be required to implement mitigation for cumulative impacts beyond payment of the TIF. In addition, the TIF Program does not mitigate for cumulative impacts that occur in neighboring jurisdictions.

#### Cumulative Traffic Impacts at Joint County/City Facilities

- The TIF does cover cumulative traffic impacts for road segments and/or intersections that are located along county/city boundaries.
- The TIF does not cover cumulative traffic impacts that occur entirely within a neighboring city.

#### **San Diego County Public Road Standards**

[<http://www.sdcountry.ca.gov/dpw/land/rtelocs.html>]

These standards provide minimum design and construction requirements for public roads. Levels of service are established for Circulation Element roads. Levels of service are not applied with the non-Circulation Element residential roads. Target design capacities, however, have been identified for these roads.

#### **San Diego County Private Road Standards**

[<http://www.sdcountry.ca.gov/dpw/land/rtelocs.html>]

These standards provide minimum design and construction requirements for private roads. Levels of service are not established for private roads. Minimum design and construction requirements, however, are established based upon the projected average daily traffic (ADT) volume on the road.

#### **SANDAG Standards - Congestion Management Program<sup>3</sup>**

[[http://www.sandag.org/uploads/projectid/projectid\\_13\\_8907.pdf](http://www.sandag.org/uploads/projectid/projectid_13_8907.pdf)]

State Proposition 111, passed by voters in 1990, established a requirement that urbanized areas prepare and regularly update a Congestion Management Program (CMP), which is a part of SANDAG's Regional Transportation Plan (RTP). The purpose of the CMP is to monitor the performance of the region's transportation system, develop programs to address near-term and long-term congestion, and better integrate transportation and land use planning. SANDAG, as the designated Congestion Management Agency for San Diego region, must develop, adopt and update the CMP in response to six specific legislative requirements further described in the report. SANDAG, local jurisdictions, and transportation operators (i.e., Caltrans, Metropolitan Transit Development Board (MTDB), North San Diego County Transit District (NCTD), etc.) are responsible for implementing and monitoring the CMP.

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<sup>3</sup> Congestion Management Program Update, November 2008, San Diego Regional Planning Agency

One component of the CMP is a Land Use Analysis Program. Under this program, the CMP requires a review of large projects that generate 2,400 or more average daily trips or 200 or more peak hour trips. This review must assess impacts to state highways and regionally significant arterials. An excerpted list of these roadways from the CMP is included below.

### **List of CMP System Roadways**

#### **CMP Freeways**

Interstate 5: Orange County Line to U.S./Mexico Border  
Interstate 8: Nimitz Boulevard to Imperial County Line  
Interstate 15: Riverside County Line to I-5  
Interstate 805: I-5 (North) to I-5 (South)  
State Route 52: I-5 to SR 25  
State Route 54: I-5 to Briarwood Road  
State Route 56: I-5 to I-15  
State Route 67: Maplevue Street to I-8  
State Route 78: I-5 to North Broadway  
State Route 94: I-5 to Avocado Boulevard  
State Route 125: SR 54 to SR 52  
State Route 125: SR 905 to San Miguel Road<sup>1</sup>  
State Route 163: I-15 to I-5  
State Route 905: Oro Vista Road to Otay Mesa Road

#### **CMP Highways**

State Route 54: SR 94 to Grove Road  
State Route 67: SR 78 to Maplevue Valley  
State Route 75: I-5 (North) to I-5 (South)  
State Route 76: Coast Highway to SR 79  
State Route 78: North Broadway to Imperial County Line  
State Route 79: Riverside County Line to I-8  
State Route 94: Avocado Boulevard to Old Highway 80  
State Route 282: Alameda Boulevard to Orange Avenue

#### **CMP Arterials**

- (1) Manchester Avenue/El Camino Real: I-5 to SR 76/Mission Avenue
- (2) Palomar Airport Road/San Marcos Boulevard: I-5 to SR
- (3) Olivenhain Road/Rancho Santa Fe Road: El Camino Real to SR 78
- (4) Centre City Parkway: I-15 (North) to I-15 (South)
- (5) Scripps Poway Parkway: I-15 to SR 67
- (6) La Jolla Village Drive/Miramar Road: I-5 to I-15
- (7) Balboa Avenue: I-5 to I-15
- (8) Sea World Drive/Friars Road/Mission Gorge Road/Woodside Avenue: I-5 to SR 67
- (9) Fletcher Parkway/Broadway/E. Main Street: I-8 (West) to I-8 (East)
- (10) Nimitz Blvd./North Harbor Dr./Grape & Hawthorne Streets/Pacific Highway/Harbor Drive: I-8 to I-5
- (11) Otay Mesa Road-Interim SR 905: SR 905 (West) to SR 905 (East)<sup>6</sup>

## **2.3 Regional and Local Traffic Impact Analysis Guidelines**

### **San Diego Traffic Engineers' Council (SANTEC) and the Institute of Traffic Engineers (ITE)**

The San Diego Traffic Engineers' Council (SANTEC) and the local chapter of the Institute of Traffic Engineers (ITE) have endorsed for use the "Guidelines of Traffic Impact Studies (TIS) in the San Diego Region." These guidelines were prepared by a traffic subcommittee formed by SANDAG. The purpose of the subcommittee was to develop a model set of guidelines for the analysis of traffic impacts for adoption and use by the various jurisdictions in the San Diego region. The goal was to foster more consistency in the assessment of traffic impacts in the San Diego region. These guidelines establish a LOS target of LOS D. Impacts would be identified for those projects that significantly increase the volume and or delay at intersections and road segments operating below LOS D (i.e. at LOS E or LOS F) either prior to or as a result of the proposed project. These guidelines have been incorporated into an appendix of the Regional Congestion Management Program (CMP) that is formally adopted by SANDAG for use by local jurisdictions. These guidelines are often used as a guideline by many local traffic-engineering consultants in the preparation of traffic impact studies in the San Diego Region. These guidelines, however, do not provide specific direction regarding the assessment of cumulative traffic impacts, unsignalized intersections or consistency with recent changes in the CEQA guidelines that removed consideration of de minimis findings/effects.

### **California Department of Transportation (Caltrans)**

The California Department of Transportation (Caltrans) has prepared a "Guide for the Preparation of Traffic Impact Studies." Objectives for the preparation of this guide include providing consistency and uniformity in the identification of traffic impacts generated by local land use proposals. In terms of level of service, Caltrans endeavors to maintain a goal of LOS C on State highway facilities. However, Caltrans acknowledges that this may not always be feasible. In these circumstances, Caltrans often accepts lower LOS on facilities that are currently operating below the LOS C objective.

### **City of San Diego**

The City of San Diego has prepared a "Traffic Impact Study Manual." The purpose is to provide guidelines to consultants on how to prepare traffic impact studies in the City of San Diego and to ensure consistency on the preparation of these studies. Impacts are identified if the proposed project will increase the traffic volume on a road segment above an identified allowable increase. The better the initial level of service on the road segment, the higher the allowable volume increase.

### 3.0 TYPICAL ADVERSE EFFECTS

#### 3.1 Traffic Congestion

Traffic related impacts are most often associated with motorized congestion on local roads and the regional circulation network. As the San Diego region grows, the number of vehicle trips that are generated by residents also grows. Historically, motor-vehicle trips have been increasing at a faster rate than that of the population growth. It is forecasted that more than 16 million vehicle trips would be made in this region each weekday by the year 2030. The personal automobile is expected to remain the primary method of travel in the region thus leading to increased motor-vehicle delay. However planned freeway and local road expansion, increased trolley and bus service, better rail service, and greater provisions for non-motorized travel would alleviate some of the traffic congestion. SANDAG's 2030 RTP details the regional improvements that are projected to occur within a twenty-year time frame, but even with these improvements providing a balanced and efficient transportation system will remain a challenge.

Increased personal automobile use affects operations on roadway segments and at intersections and ramps, which in turn results in decreases in traffic flow on roadways and longer queues at intersections and ramps. These delays add time to drivers' daily commutes and can cause noticeable increases in traffic congestion.

The County has established a level of service (LOS) of D a baseline goal for acceptable level of service on a roadway or at an intersection. This baseline, however, may not be achievable or desirable for many corridors and/or intersections. Substantial impacts to biological resources, community character, historical buildings, existing residences or businesses, and/or other resources may make physical improvements to provide LOS D or better impractical or infeasible.

It is important to note that policies aimed at avoiding traffic congestion may conflict with other important community goals or values. Standards that solely measure motor vehicle level of service do not account for the experience of other road users. This may discourage infill development or land use goals identified in a community plan to promote decreased reliance on automobile trips. Mitigation measures to improve an intersection or widen a road may conflict with the walkability of a town center or preservation of sensitive environmental resources. Finally, enhancing roadway capacity may have the adverse effect encouraging more people to drive thereby conflicting with goals that encourage multi-modal transportation and/or seek to reduce vehicle miles traveled.

### **3.2 Connectivity**

The County's road network is made up of a variety of roadway classifications, which allow people to travel throughout the County. However, at times there are physical limitations, such as steep topography, which partially constrain connectivity on existing roadways and preclude the construction on new roadway connections. In order to address connectivity issues alternative road networks to access potential connections may be required.

### **3.3 Hazards Due to an Existing Transportation Design Feature**

Increased traffic generated or redistributed by a proposed project may cause a significant traffic operational impact to an existing transportation design feature and result in potential hazards. These hazards can occur due to a design features or physical configuration of existing or proposed access roads and can adversely affect the safe transport of vehicles along a roadway. The physical conditions of the project site and surrounding area, such as curves, slopes, walls, landscaping or other barriers, may also result in vehicle conflicts with other vehicles or stationary objects.

### **3.4 Hazards to Pedestrians or Bicyclists**

Increased motor vehicle traffic generated or redistributed by a proposed project may cause a significant traffic operational impact to pedestrians or bicyclists and result in potential hazards. These hazards can occur for a variety of reasons including:

- A design feature or physical configurations on a road segment or at an intersection that may adversely affect the visibility of pedestrians or bicyclists to drivers entering and exiting the site, and the visibility of cars to pedestrians and bicyclists;
- High amount of pedestrian activity at the project access points.
- Precluding or substantially hindering the provision of a planned bike lane or pedestrian facility on a roadway adjacent to the project site.
- The physical conditions of the project site and surrounding area, such as curves, slopes, walls, landscaping or other barriers may result in vehicle/pedestrian, vehicle/bicycle conflicts.
- The project may result in a substantial increase in pedestrian or bicycle activity without the presence of adequate facilities.

## 4.0 GUIDELINES FOR DETERMINING SIGNIFICANCE

The following significance guidelines should guide the evaluation of whether a significant impact to transportation and traffic will occur as a result of project implementation. A project will generally be considered to have a significant effect if it proposes any of the following, absent specific evidence to the contrary. Conversely, if a project does not propose any of the following, it will generally not be considered to have a significant effect on transportation and traffic, absent specific evidence of such an effect.

This section provides guidance for evaluating adverse environmental effects a project may have in relation to traffic and transportation. The guidelines for determining significance are organized into eight categories: road segments, intersections, two-lane highways, ramps, congestion management plan, hazards due to an existing transportation design feature, hazards to pedestrians or bicyclists, and public transportation.

### Land Development Projects

Land Development projects are projects that may result in an increase in the density or intensity or use on a parcel or parcels of land. These projects include, but are not limited to subdivisions, use permits, rezones and general plan amendments. Land development projects, typically, require discretionary approval. Due to the increased intensity of uses, land development projects generate additional traffic onto the County's road network and can contribute towards traffic congestion. A traffic impact study is often required to fully assess potential traffic impacts that may result from implementation of the proposed project.

### Road Improvement Projects

Road improvement projects are projects that can affect transportation system operations; including level of service and other performance measures. Projects may consist of increasing road capacity or improving the traffic operations on the County's road network. This section refers to stand alone road improvement projects that are not improvements associated with a proposed development. These projects are typically publicly initiated. Road improvement projects do not generate additional trips but, in some cases, may cause a redistribution of trips on the County's road network. Road improvement projects are typically one or more of the following; road widening, construction of new road, intersection improvements and operational improvements/road maintenance. Additional guidance on how to evaluate Publicly Initiated Road Improvement Projects is included as Attachment B of the Report Format and Content Requirements.

#### 4.1 Road Segments

Pursuant to the County's General Plan Public Facilities Element (PFE Pg. XII-4-18), new development must provide improvements or other measures to mitigate traffic impacts to avoid:

- (a) Reduction in Level of Service (LOS) below "C" for on-site Circulation Element roads;
- (b) Reduction in LOS below "D" for off-site and on-site abutting Circulation Element roads; and
- (c) "Significantly impacting congestion" on roads that operate at LOS "E" or "F". If impacts cannot be mitigated, the project cannot be approved unless a statement of overriding findings is made pursuant to the State CEQA Guidelines. The PFE, however, does not include specific guidelines for determining the amount of additional traffic that would "significantly impact congestion" on such roads.

The County has created the following guidelines to evaluate likely motor vehicle traffic impacts of a proposed project for road segments and intersections serving that project site, for purposes of determining whether the development would "significantly impact congestion" on the referenced LOS E and F roads. The guidelines are summarized in Table 1. The levels in Table 1 are based upon average operating conditions on County roadways. It should be noted that these levels only establish general guidelines, and that the specific project location must be taken into account in conducting an analysis of traffic impact from new development.

##### **On-site Circulation Element Roads**

PFE, Transportation, Policy 1.1 states that "new development shall provide needed roadway expansion and improvements on-site to meet demand created by the development, and to maintain a Level of Service C on Circulation Element Roads during peak traffic hours". Pursuant to this policy, a significant traffic impact would result if:

- ***The additional or redistributed ADT generated by the proposed land development project will cause on-site Circulation Element Roads to operate below LOS C during peak traffic hours except within the Otay Ranch and Harmony Grove Village plans as specified in the PFE, Implementation Measure 1.1.2.***

##### **Off-site Circulation Element Roads**

PFE, Transportation, Policy 1.1 also addresses offsite Circulation Element roads. It states, "new development shall provide off-site improvements designed to contribute to the overall achievement of a Level of Service D on Circulation Element Roads". Implementation Measure 1.1.3 addresses projects that would significantly impact

congestion on roads at LOS E or F. It states that new development that would significantly impact congestion on roads operating at LOS E or F, either currently or as a result of the project, will be denied unless improvements are scheduled to attain a LOS to D or better or appropriate mitigation is provided. The following significance guidelines define a method for evaluating whether or not increased traffic volumes generated or redistributed from a proposed project will "significantly impact congestion" on County roads, operating at LOS E or F, either currently or as a result of the project.

Traffic volume increases from public or private projects that result in one or more of the following criteria will have a significant traffic volume or level of service traffic impact on a road segment:

- *The additional or redistributed ADT generated by the proposed project will significantly increase congestion on a Circulation Element Road or State Highway currently operating at LOS E or LOS F, or will cause a Circulation Element Road or State Highway to operate at a LOS E or LOS F as a result of the proposed project as identified in Table 1, or*
- *The additional or redistributed ADT generated by the proposed project will cause a residential street to exceed its design capacity.*

Table 1  
Measures of Significant Project Impacts to Congestion on Circulation Element Road Segments:  
Allowable Increases on Congested Road Segments

Level of service	Two-lane road	Four-lane road	Six-lane road
LOS E	200 ADT	400 ADT	600 ADT
LOS F	100 ADT	200 ADT	300 ADT
Notes:			
1. By adding proposed project trips to all other trips from a list of projects, this same table must be used to determine if total cumulative impacts are significant. If cumulative impacts are found to be significant, each project that contributes additional trips must mitigate a share of the cumulative impacts.			
2. The County may also determine impacts have occurred on roads even when a project's traffic or cumulative impacts do not trigger an unacceptable level of service, when such traffic uses a significant amount of remaining road capacity.			

## LOS E

The first significance criterion listed in Table 1 addresses roadways presently operating at LOS E. Based on these criteria, an impact from new development on an LOS E road would be reached when the increase in average daily trips (ADT) on a two-lane road exceeds 200 ADT. Using SANDAG's "Brief Guide for Vehicular Traffic Generation Rates for the San Diego Region" for most discretionary projects this would generate less than 25 peak hour trips. On average, during peak hour conditions, this would be only one additional car every 2.4 minutes.

Therefore, the addition of 200 ADT, in most cases, would result in changes to traffic flow that would not be noticeable to the average driver and therefore would not constitute a significant impact on the roadway. Significance criteria were also established for 4-lane and 6-lane roads operating at LOS E and are based upon the above 24 hour ADT significance criterion established for two-lane roads. The two-lane road criterion was doubled to determine impacts to four-lane roads and tripled to determine impacts to six-lane roads. This was considered to be conservative since the 24 hour per lane road capacity for a 4-lane road is more than double that of a two-lane road and the per lane capacity of a six-lane road is more than triple that of the two-lane road. For LOS E roads, the additional significance criteria are 400 ADT for a 4-lane road and 600 ADT for a 6-lane road.

Similar to the criteria for two-lane roads, 400 ADT for a 4-lane road and 600 ADT for a 6-lane road criteria would generate less than 25 per lane peak hour trips for most discretionary projects. On average, during peak hour conditions, this would be only one additional car per lane every 2.4 minutes. The addition of 200 ADT per lane (400 ADT for a 4 lane road or 600 ADT for a 6 lane road), in most cases, would result in changes to traffic flow that would not be noticeable to the average driver and therefore would not constitute a significant impact on the roadway. Road capacities based upon level of service for County roads can be found in the County's Public Road Standards, available online at <http://www.sdcountry.ca.gov/dpw/land/rtelocs.html>.

## **LOS F**

The second significance criteria listed in Table 1 addresses roadways presently operating at LOS F. Under LOS F congested conditions, small changes and disruptions to the traffic flow on County Circulation Element Roads can have a greater effect on traffic operations when compared to other LOS conditions. In order to better account for potential effects of increased traffic on LOS F roads more stringent significance criteria was established when compared to that for LOS E. Based on this guidance, an impact from new development on an LOS F road would be reached when the increase in average daily trips (ADT) on a two-lane road exceeds 100. Again, using SANDAG's "Brief Guide for Vehicular Traffic Generation Rates for the San Diego Region" for most discretionary projects this would generate less than 12.5 peak hour trips. On average, during peak hour conditions, this would be only one additional car every 4.8 minutes.

The addition of 100 ADT, in most cases, would not be noticeable to the average driver and therefore would not constitute a significant impact on the roadway. The same approach used to determine significance criteria for 4-lane and 6-lane roads operating at LOS E was used to determine appropriate significance criteria for four-lane and six-lane roads operating at LOS F. Based on this approach, the significance criteria for a four-lane road (200 ADT) and for a six-lane road (300 ADT) would generate less than 12.5 per lane peak hour trips for most discretionary projects. On average, during peak hour conditions, this would be only one additional car per lane every 4.8 minutes. The addition of 100 per lane ADT (200 ADT for a 4-lane road and 300 ADT for a 6-lane road) would, in most cases, not be noticeable to the average driver and therefore would not constitute a significant impact on the roadway.

In summary, under extremely congested LOS F conditions, small changes and disruptions to the traffic flow can significantly affect traffic operations and additional project traffic can increase the likelihood or frequency of these events. Therefore, the LOS F ADT significance criteria was set at 100 ADT (50% of the LOS E criterion) to provide a higher level of assurance that the traffic allowed under the criterion would not significantly impact traffic operation on the road segment.

## Non-Circulation Element Residential Streets

Levels of service are not applied to residential streets since their primary purpose is to serve abutting lots and not to carry through traffic, however, for projects that will substantially increase traffic volumes on residential streets, a comparison of the traffic volumes on the residential streets with the recommended design capacity must be provided. Recommended design capacities for residential non-Circulation Element streets are provided in the San Diego County Public and Private Road Standards. Traffic volume that exceeds the design capacity on residential streets may impact residences and should be analyzed on a case-by-case basis.

## 4.2 Intersections

This section provides guidance for evaluating adverse environmental effects a project may have on signalized and unsignalized intersections. Table 2 summarizes significant project impacts for signalized and unsignalized intersections.

**Table 2**  
**Measures of Significant Project Impacts to Congestion on Intersections:**  
**Allowable Increases on Congested Intersections**

Level of Service	Signalized	Unsignalized
LOS E	Delay of 2 seconds or less	20 or less peak hour trips on a critical movement
LOS F	Either a Delay of 1 second, or 5 peak hour trips or less on a critical movement	5 or less peak hour trips on a critical movement
<b>Notes:</b> <ol style="list-style-type: none"> <li>1. A critical movement is an intersection movement (right turn, left turn, through-movement) that experiences excessive queues, which typically operate at LOS F. Also if a project adds significant volume to a minor roadway approach, a gap study should be provided that details the headways between vehicles on the major roadway.</li> <li>2. By adding proposed project trips to all other trips from a list of projects, these same tables are used to determine if total cumulative impacts are significant. If cumulative impacts are found to be significant, each project is responsible for mitigating its share of the cumulative impact.</li> <li>3. The County may also determine impacts have occurred on roads even when a project's direct or cumulative impacts do not trigger an unacceptable level of service, when such traffic uses a significant amount of remaining road capacity.</li> <li>4. For determining significance at signalized intersections with LOS F conditions, the analysis must evaluate both the delay <u>and</u> the number of trips on a critical movement, exceedance of either criteria result in a significant impact.</li> </ol>		

#### 4.2.1 Signalized

Traffic volume increases from public or private projects that result in one or more of the following criteria will have a significant traffic volume or level of service traffic impact on a signalized intersection:

- *The additional or redistributed ADT generated by the proposed project will significantly increase congestion on a signalized intersection currently operating at LOS E or LOS F, or will cause a signalized intersection to operate at a LOS E or LOS F as identified in Table 2.*
- *Based upon an evaluation of existing accident rates, the signal priority list, intersection geometrics, proximity of adjacent driveways, sight distance or other factors, the project would significantly impact the operations of the intersection.*

##### LOS E

The significance criterion for signalized intersections identified in Table 2 allows an increase in the overall delay at an intersection operating at LOS E of two seconds. This is consistent with the capacity limit contained in the SANDAG's CMP and guidelines established by the City of San Diego. A delay of two seconds is a small fraction of the typical cycle length for a signalized intersection that ranges between 60 and 120 seconds. The likelihood of increased queues forming due to the additional two seconds of delay is low. Therefore, an increased wait time of two seconds, on average, would result in changes to traffic flow that would not be noticeable to the average driver. Therefore the significance guideline for intersections operating at LOS E is 2 seconds.

##### LOS F

The primary significance criterion for signalized intersections operating at LOS F conditions was based upon increased delay at the intersection. Under LOS F congested conditions, small changes and disruptions to the traffic flow to signalized intersections can have a greater effect on overall intersection operations when compared to other LOS conditions. In order to better account for potential effects of increased traffic at signalized intersections operating at LOS F, a more stringent guideline was established when compared to signalized intersection operating at LOS E. A significance guideline of an increased delay of 1 second was established for signalized intersections operating at LOS F. An increase in the overall delay at an intersection of one second, on average, would result in changes to traffic flow that would not be noticeable to the average driver. Therefore the significance guideline for intersections operating at LOS F is 1 second.

Signalized intersections operating at LOS F also have the potential for substantial queuing at specific turning movements that may detrimentally effect overall intersection and/or road segment operations. Thus, an increase of peak hour trips to a critical move was also established as a secondary significance criterion for signalized intersections. A critical movement would be a movement or a lane at an intersection that is experiencing queuing or substantial delay and is affecting the overall operation of the

intersection. The increase in peak hour trips to a critical move is a measurement of how many cars can be added to an existing queue. The addition of more than five trips (peak hour) per critical movement will normally be considered a significant impact. This significance criterion was selected because the five or less additional trips spread out over the peak hour would not significantly increase the length of an existing queue and would not be noticeable to the average driver (5 peak hour trips equals one trip every 12 minutes or 720 seconds).

For LOS F intersections, the 5 peak hour trips to a critical movement would not be noticeable to the average driver since the one additional trip during the 12 minute interval on average would clear the traffic signal cycles well within the 12 minute period. It should also be noted that if the 5 additional peak hour trips arrived at the same time these trips would also clear the traffic cycle and existing queue lengths would be re-established.

#### **4.2.2 Unsignalized**

Traffic volume increases from public or private projects that result in one or more of the following criteria will have a significant impact to an unsignalized intersection as listed in Table 2 and described as text below:

- *The additional or redistributed ADT generated by the proposed project will add 21 or more peak hour trips to a critical movement of an unsignalized intersection, and cause an unsignalized intersection to operate below LOS D, or*
- *The additional or redistributed ADT generated by the proposed project will add 21 or more peak hour trips to a critical movement of an unsignalized intersection currently operating at LOS E, or*
- *The additional or redistributed ADT generated by the proposed project will add 6 or more peak hour trips to a critical movement of an unsignalized intersection, and cause the unsignalized intersection to operate at LOS F, or*
- *The additional or redistributed ADT generated by the proposed project will add 6 or more peak hour trips to a critical movement of an unsignalized intersection currently operating at LOS F, or*
- *Based upon an evaluation of existing accident rates, the signal priority list, intersection geometrics, proximity of adjacent driveways, sight distance or other factors, the project would significantly impact the operations of the intersection.*

The operating parameters and conditions for unsignalized intersections differ dramatically from those of signalized intersections. Very small volume increases on one leg or turn and/or through movement of an unsignalized intersection can substantially affect the calculated delay for the entire intersection. As noted in Table 2 on page 15, significance criteria for unsignalized intersections are based upon a minimum number of trips added to a critical movement at an unsignalized intersection.

#### **LOS E**

The significance guidelines for unsignalized intersections identify a minimum number of trips added to a critical movement at an unsignalized intersection. Since the operations of unsignalized intersections under congested conditions are heavily influenced by traffic volume increases on critical moves, the significance guidelines for unsignalized intersections were based upon the number of trips added to a critical movement. This guideline directly relates to the number of vehicles that can be added to an existing queue that forms at the intersection. A significance criteria of (21) twenty-one or more trips (peak hour) per critical movement was used for LOS E conditions. Although delays drivers experience under LOS E condition may be noticeable, they are not yet considered unacceptable. Twenty trips spread out over the peak hour would not likely cause the intersection delay or existing queue lengths to become unacceptable. The twenty trips (peak hour) would not be noticeable to the average driver.

The operations of unsignalized intersections under congested conditions are heavily influenced by traffic volume increases on critical moves. Therefore, the significance guidelines for unsignalized intersections are based upon the number of peak hour trips added to a critical movement at that intersection. This guideline examines the number of vehicles that may be added to an existing queue that forms at the intersection by the additional traffic generated by a project. In LOS E situations, the delays that drivers experience are noticeable, but are not considered excessive. A peak hour increase of twenty trips to the critical movement of an unsignalized intersection would be, on average, one additional car every 3.0 minutes or 180 seconds. Assuming the average wait time for a vehicle in the critical movement queue is less than 3.0 minutes, which is typical for LOS E condition, this would not be noticeable to the average driver and would not be considered a significant impact.

#### **LOS F**

For LOS F conditions, a significance level of 6 or more trips (peak hour) per critical movement was used. Five trips or less spread out over the peak hour would not significantly increase the length of an existing queue and would not be noticeable to the average driver. For example, 5 trips spread out over an hour would be one car every 12 minutes. This typically exceeds the average wait time in the queue and would not be noticeable to the average driver.

### **4.3 Two-Lane Highways**

This section provides level of service impact guidelines for State highways and County arterials operating as two-lane highways.

Several designated County Circulation Element Roads are State highways that are managed and maintained by Caltrans. These highways include State Route 67, State Route 76, State Route 78, State Route 79 and State Route 94 and within the unincorporated area of the County most of these routes operate as two-lane highways. Caltrans has prepared a "Guide for the Preparation of Traffic Impact Studies" that should also be referenced when evaluating traffic impacts to the above Circulation Element Roads that are under the jurisdiction of Caltrans. Also, Caltrans District 11 local office should be consulted early to adequately scope the traffic study and ensure potential local district issues in the traffic impact study are addressed. While the "Guide for the Preparation of Traffic Impact Studies" provides guidance for scoping a traffic study to assess impacts on Caltrans facilities, it does not provide specific guidelines for determining when a significant traffic impact occurs; hence, the development of the following significance guidelines for two-lane highways.

In addition to the State Routes identified above, several County Circulation Element Roads, although designated as arterials, operate as two-lane highways. These include roadways that have passing opportunities for 40% or more along the length of the roadway and/or have few/limited access points and intersections along the length of the roadway. Examples would include sections of Old Highway 80, Old Highway 395 and Del Dios Highway. The Highway Capacity Manual (HCM) includes analysis criteria for assessment of LOS for two-lane highways. Section 2.2 of the County of San Diego's "Transportation and Traffic Report Format and Content Requirements" states that "The Director of Public Works may, based upon a review of the operational characteristics of the roadway, designate that a HCM analysis be used to determine the LOS for a two-lane County arterial in lieu of the LOS table provided in the County of San Diego Public Road Standards." Level of service tables for two-lane highways have also been established by the County of Riverside and the County of Sacramento.

#### **4.3.1 Signalized Intersection Spacing Over One Mile**

This section provides LOS impact significance levels for State highways and County arterials operating as two-lane highways with signalized intersection spacing over one mile. County arterials were addressed in section 4.1 and Table 1, however, those that operate as two-lane highways would have higher project contribution amounts and different LOS E and LOS F levels and are treated in this section.

**Table 3**  
**Measures of Significant Project Impacts to Congestion: Allowable Increases**  
**on Two-lane Highways with Signalized Intersection Spacing Over One Mile**

Level of Service	LOS Criteria	Impact Significance Level
LOS E	> 16,200 ADT	>325 ADT
LOS F	> 22,900 ADT	>225 ADT
<b>Note:</b> Where detailed data are available, the Director of Public Works may also accept a detailed level of service analysis based upon the two-lane highway analysis procedures provided in the Chapter 20 Highway Capacity Manual.		

Two-lane highways with intersection spacing over one mile have minimal side friction and conform to the HCM assumptions for two-lane highways. Level of service criteria for LOS E and LOS F are provided in Table 3 based upon criteria established with the Counties of Riverside and Sacramento and concurred upon by Caltrans-District 11. These criteria are appropriate for use for most projects with the potential to affect two-lane highways, as road conditions for two-lane highways in these Counties are similar to those in the County of San Diego. The ADT based guidelines should be the first applied method of analysis, however, County staff may allow the use of HCM Chapter 20 methodology (average travel speed and/or percent time spent following) to provide a more detailed evaluation and to determine the overall level of service in certain cases, with the approval of the Director of Public Works. Where impacts to State Highways are involved, consultation with Caltrans is recommended.

### **LOS E**

Impact significance levels are provided in Table 3 for two-lane highways with signalized intersection spacing over one mile. The first impact significance level addresses impacts from new development (both direct and cumulative impacts) on an LOS E road. In this scenario a significant impact would be reached when the increase in average daily trips (ADT) on a two-lane road exceeds 325. For most discretionary projects, the 325 ADT level would generate less than 35 peak hour trips. On average, during peak hour conditions, this would be only one additional car every 1.7 minutes. The addition of 325 ADT would, in most cases, not be noticeable to the average driver on a two-lane highway which has higher speeds and reduced side friction compared to a typical arterial. The additional 325 ADT, therefore, would not constitute a significant impact on a two-lane highway operating at LOS E; however, the addition of more than 325 ADT would generally result in a significant impact.

### **LOS F**

The second impact significance guideline concerns roadways presently operating at LOS F (for a 2-lane highway LOS F would not occur until ADT exceeds 22,900 trips per day. Under LOS F congested conditions, small changes and disruptions to the traffic flow on County Circulation Element Roads can have a greater affect on traffic operations when compared to other LOS conditions. In order to better account for potential effects of increased traffic on LOS F roads, a more stringent guideline was established when compared to that for LOS E. The guideline for determining significance from new development (both direct and cumulative impacts) on a LOS F

road would be reached when the increase in average daily trips (ADT) on a two-lane road exceeds 225. For most discretionary projects, the 225 ADT level would generate less than 25 peak hour trips. On average, during peak hour conditions, this would be only one additional car every 2.4 minutes. The addition of 225 ADT would, in most cases, not be noticeable to the average driver on a two-lane highway which has higher speeds and reduced side friction compared to a typical arterial. The addition 225 ADT or less would therefore not constitute a significant impact on a two-lane highway operating at LOS F. However, the addition of more than 225 ADT would be considered a significant impact.

#### 4.3.2 Signalized Intersection Spacing Under One Mile

This section provides level of service impact guidelines for State highway segments and County arterials operating as two-lane highways with signalized intersection spacing under one mile. Typical examples of this type of roadway are those segments of two lane highways that traverse town centers. Similar to the experience of drivers in urban areas with closely spaced intersections, the functionality of two-lane highway conditions with signalized intersections spacing under one mile becomes constrained not due to the segment capacity but the intersection operations. Therefore the assessment of operations of intersections on two-lane highways shall be guided by a Level of Service standard. Level of Service for purposes of this significance guideline is based upon the overall intersection operations – similar to Urban Street analysis in Chapter 15 Highway Capacity Manual. For determining impact significance at the signalized intersection, Table 4 “Measures of Significant Project Impacts to Congestion on Intersections Allowable Increases on Congested Intersections” may be used as summarized below:

**Table 4**  
**Measures of Significant Project Impacts to Congestion: Allowable Increases**  
**on Two-lane Highways with Signalized Intersection Spacing Under One Mile**

Level of Service	Signalized
LOS E	Delay of 2 seconds or less
LOS F	Delay of 1 second, or 5 peak hour trips or less on a critical movement
<b>Notes:</b> <ol style="list-style-type: none"> <li>1. A critical movement is an intersection movement (right turn, left turn, through-movement) that experiences excessive queues which typically operate at LOS F.</li> <li>2. By adding proposed project trips to all other trips from a list of projects, these same tables are used to determine if total cumulative impacts are significant. If cumulative impacts are found to be significant, each project is responsible for mitigating its share of the cumulative impact.</li> <li>3. The County may also determine impacts have occurred on roads even when a project's traffic or cumulative impacts do not trigger an unacceptable level of service, when such traffic uses a significant amount of remaining road capacity.</li> </ol>	

The second impact significance guideline (Table 4) concerns two-lane highways with signalized intersection spacing less than 1 mile. Two-lane highways with intersection spacing less than 1 mile operate similar to urban streets as identified in the HCM. Per the HCM, level Urban Streets have lower speeds with levels of service most

characterized by the operation of the intersections along the highway/street. For two-lane highways with intersection spacing less than 1 mile, the level of service will be determined to be that of the intersections along the highway. Impacts to the highway will be determined by evaluating the intersection impact criteria identified in Table 4.

Impacts related to operational features on two-lane highways will be evaluated on a case-by-case basis based upon traffic flow patterns, geometrics, available sight distance, accident histories, and other factors. Coordination with County staff and Caltrans is recommended regarding any additional operational analysis that may be necessary.

#### **4.4 Ramps**

Additional or redistributed ADT generated by the proposed project may significantly increase congestion at a freeway ramp. Caltrans' "Guide for the Preparation of Traffic Impact Studies" states that an operational analysis based upon Caltrans' Highway Design Manual should be used in the evaluation of ramps and that Caltrans' Ramp Metering Guidelines should be used in the preparation of the operational analysis. However, specific criteria for the determination of an impact at a ramp are not provided in the above documents.

The CMP includes guidelines for the determination of traffic impacts at a ramp. These guidelines are summarized in Table 5. Table 5 may be used as a guide in determining significant increases in congestion on ramps and for identifying conflicts with the congestion management program. Other factors that may be considered include ramp metering, location (rural vs. urban), ramp design, and the proximity of adjacent intersections. Coordination with Caltrans and the local jurisdiction should be conducted to determine appropriate impact criteria for the specific ramps being assessed.

#### **4.5 Congestion Management Program**

Projects that generate over 2,400 ADT or 200 peak hour trips, must comply with the traffic study requirements of SANDAG's Congestion Management Program. Trip distributions for these projects must also use the current regional computer traffic model. Projects that must prepare a CMP analysis should also follow the CMP traffic impact analysis guidelines. These guidelines are summarized in Table 5.

**Table 5**  
**Measure of Significant Project Traffic Impacts for**  
**Circulation Element Roads, Signalized Intersections, and Ramps**

Level of Service With Project	Allowable Change Due to Project Impact						
	Freeways		Roadway Segments*		Intersections**	Ramps**	Ramps with >15 min. delay
	V/C	Speed (mph)	V/C	Speed (mph)	Delay (sec.)	Delay (min.)	Delay (min.)
E & F	0.01	1	0.02	1	2	-	2
<p>* For County arterials, which are not identified in SANDAG's Regional Transportation Plan and Congestion Management Program as regionally significant arterials, significance may be measured based upon an increase in average daily trips. The allowable change in ADT due to project impacts in this instance would be identified in Table 1.</p> <p>** Signalized Intersections</p> <p>*** See the Report Format and Content Requirements for guidance on ramp metering analysis.</p> <p><u>KEY</u></p> <p>V/C = Volume to Capacity ratio</p> <p>Speed = Speed measured in miles per hour</p> <p>Delay = Average stopped delay per vehicle measured in seconds, or minutes</p> <p>LOS = Level of Service</p> <p>ADT = Average Daily Trips</p>							

#### **4.6 Hazards Due to an Existing Transportation Design Feature**

Many roadways and intersections in the County were designed and constructed prior to the adoption of current road design standards. The design of the roadways and intersections that were able to handle lower traffic volumes, may pose an increased risk if traffic volumes substantially increase along the road segment or at the intersection as a result of the proposed project. Increased traffic generated or redistributed by a proposed project may cause a significant traffic operational impact to an existing transportation design feature. Therefore, it is necessary to evaluate potential hazards to an existing transportation design feature.

The determination of significant hazards to an existing transportation design feature shall be on a case-by-case basis, considering the following factors:

- Design features/physical configurations of access roads may adversely affect the safe movement of all users along the roadway.
- The percentage or magnitude of increased traffic on the road due to the proposed project may affect the safety of the roadway.
- The physical conditions of the project site and surrounding area, such as curves, slopes, walls, landscaping or other barriers, may result in conflicts with other users or stationary objects.

- Conformance of existing and proposed roads to the requirements of the private or public road standards, as applicable.

#### **4.7 Hazards to Pedestrians or Bicyclists**

Many roadways and intersections in the County do not currently have pedestrian or bicycle facilities. The roadways and intersections designed prior to adoption of current road standards may have conditions that may pose an increased risk if traffic volumes, pedestrian volumes, or bicycle volumes substantially increase along the road segment or at the intersection, as a result of the proposed project. Increased traffic generated or redistributed by a proposed project may cause a significant traffic operational impact to pedestrians or bicyclists. Therefore, it is necessary to evaluate potential hazards to pedestrians or bicyclists.

The determination of significant hazards to pedestrians or bicyclists shall be on a case-by-case basis, considering the following factors:

- Design features/physical configurations on a road segment or at an intersection that may adversely affect the visibility of pedestrians or bicyclists to drivers entering and exiting the site, and the visibility of cars to pedestrians and bicyclists.
- The amount of pedestrian activity at the project access points that may adversely affect pedestrian safety.
- The preclusion or substantial hindrance of the provision of a planned bike lane or pedestrian facility on a roadway adjacent to the project site.
- The percentage or magnitude of increased traffic on the road due to the proposed project that may adversely affect pedestrian and bicycle safety.
- The physical conditions of the project site and surrounding area, such as curves, slopes, walls, landscaping or other barriers that may result in vehicle/pedestrian, vehicle/bicycle conflicts.
- Conformance of existing and proposed roads to the requirements of the private or public road standards, as applicable.
- The potential for a substantial increase in pedestrian or bicycle activity without the presence of adequate facilities.

#### **4.8 Alternative Transportation**

Alternative transportation (cycling, walking, and transit use) is addressed in the County's General Plan Public Facilities Element (PFE). The County's stated objective for alternative transportation is addressed by the PFE, Objective 4. Objective 4 asks for a "Reduction in the demand on the road system through increased public use of alternate forms of transportation and other means." Pursuant to Objective 4, Policies 4.1 – 4.4 establish a means for the County to meet the objective. As such, if a proposed project is not in conformance with the applicable alternative transportation policies in the PFE, a significant conflict with the County's alternative transportation policies may occur.

## **5.0 STANDARD MITIGATION AND PROJECT DESIGN CONSIDERATIONS**

If a proposed project's traffic results in a significant traffic impact (per the criteria specified above), mitigation for the traffic impact must be proposed. If mitigation is infeasible or impractical, the technical, economic, and physical reasons for the infeasibility must be detailed to support a statement of overriding considerations under CEQA. Potential mitigation measures can include traffic signal improvements, physical road improvements, street re-striping and parking prohibitions, fair share contributions toward identified, funded and scheduled projects, and transportation demand management programs.

A variety of possible generalized mitigation measures are provided below. It should be recognized that a variety of improvements may be required to mitigate direct impacts depending on the extent of the project's impact. For example, a project may identify a direct impact to a road segment; however the entire segment may not need to be improved. Depending on the situation, frontage improvements or turn pockets may adequately mitigate the impact. However, analysis must be provided to demonstrate that with implementation of the proposed mitigation measure, conditions would either not change or not become worse with the implementation of the project. For example, travel time or queue lengths may need to be quantified to justify the adequacy of a proposed mitigation measure as being proportional to the project's significant impact. It should be noted that fair share contributions are not adequate to fully mitigate a direct impact because the construction of actual improvements must be in place prior to the project impact occurring. Consult with County staff, as necessary, for further information. Conceptual striping plans to ensure feasibility of the proposed mitigation measures may be required.

### **5.1 Traffic Signal Improvements**

- New Signal (provided that it meets traffic signal warrants)
- Signal modifications including timing, coordination, phasing improvements, etc.

### **5.2 Physical Road Improvements**

- Turn Restrictions
- New Roadway
- Curve Realignment
- Roadway widening to add lanes or shoulders
- Provision of pathway or sidewalk
- Extension of truncated street
- Shoulder provisions for bicycle-lanes
- Redesign of freeway on- and off-ramps
- Median construction/modification to restrict access
- Flaring of intersections to add turn lanes
- Provision of passing lanes or turnouts
- Acceleration and deceleration lanes

- Removal of obstructions (vegetation, rock outcroppings, utilities, etc.)
- Roundabouts

### **5.3 Street Re-striping and Parking Restrictions**

- Re-striping to add lanes with or without parking removal or restrictions
- Protected left-turn pockets, or free right turn lanes
- Parking restrictions, daily or during peak hours
- Bicycle lanes and or sharrows

### **5.4 Fair Share Contributions**

- Payment of the County's Traffic Impact Fee for mitigation of cumulative impacts within the unincorporated County (Refer to Section 2.2 of these Guidelines for discussion of how the TIF mitigates cumulative impacts)
- Contribution of funds to approved projects identified in the County's Capital Improvement Program Plan
- Agreement between an applicant and a City or non-County agency to contribute a fair share payment towards the construction of a specific traffic improvement found adequate by the County for impacts outside of the jurisdiction of the unincorporated County (Refer to Section 5.0 of the Report Format and Content Requirements for additional discussion of impacts outside of the County's jurisdiction).

### **5.5 Transportation Demand Management\***

- Flexible or staggered work hours
- Properly pricing parking
- Transit incentives and improvements including subsidized transit passes, bus turnouts, or bus shelters/benches
- Carpool, vanpool programs and participation in a computerized matching system
- Incentives to promote bicycle and walk trip modal split

\* Implementation of these measures will require monitoring on an on-going basis.

### **5.6 Traffic Safety/Hazards to Pedestrians or Bicyclists**

If traffic safety or pedestrian/bicycle safety impacts are present, then conditions are placed on a project prior to approval to address those concerns. Often, compliance with County of San Diego Public or Private Road Standards will provide sufficient mitigation for an identified impact. However, site specific mitigation measures, such as the improvement of sight distance along the frontage of a project, will be imposed as a condition of approval. Conceptual striping plans to ensure feasibility of the proposed mitigation measures may be required.

Projects that would generate a high demand for pedestrian traffic such as schools, shopping centers, and large office parks may be required to provide pedestrian and bicycle routes to the facilities to accommodate the pedestrian demand.

Bicycle lanes and routes designated on the County's General Plan/Circulation Element must be specified and existing facilities identified. Provisions to provide/accommodate the ultimate right-of-way needed to construct designated bike lanes must be incorporated into the proposed project. Construction of bicycle lanes may be based upon the demand and connections to existing facilities in the area.

### **5.7 Alternative Transportation**

Alternative transportation is addressed in the County's General Plan Public Facilities Element (PFE), Policies 4.1 – 4.4. The PFE identifies several viable ways of promoting alternative transportation and to reduce demand on the road system. However, many of these solutions are programmatic in nature and cannot typically be implemented by an individual project. Program level solutions include establishing incentive programs for employers to encourage their employees to use alternative transportation and coordinating the planning and development of transit centers with other jurisdictions and public transportation agencies. Project level solutions include identifying the need for transit improvements for large scale projects and conditioning new development on the dedication and construction of bikeways as indicated in the Circulation Element's Bicycle Network.

### **5.8 Project Phasing**

If a proposed project will be developed in phases and the county agrees that phased implementation of mitigation measures is a feasible option, the traffic analysis will need to identify impacts and associated mitigation according to each phase of development. The implementation of mitigation measures would be timed with each project phase to address the impacts that each phase of development would create. The traffic analysis will need to evaluate each phase separately in order to justify the mitigation that will be implemented at each phase. For example, if a project proposes to construct in phases (stages) or with interim uses before full build out, then the traffic study shall detail the projects traffic impacts and needed mitigation for each phase (stage) as it comes online and identify appropriate mitigation at each stage. This level of analysis will allow County staff to draft road and frontage improvement conditions in conjunction with actual project improvements via phasing or stages.

## 6.0 REFERENCES

California Department of Transportation, Guidelines for the Preparation of Traffic Impact Studies, May 18, 2000.

California Public Resources Code, California Environmental Quality Act (PRC §21000-21178).

City of Los Angeles, Draft L.A. CEQA Thresholds Guideline, Section F, Transportation, Section F.1 through F.8. Unadopted document, May 14, 1998.

City of San Diego, Traffic Impact Study Manual, July 1998.

County of San Diego  
CEQA Guidelines, 2009.

General Plan - Part XII, Public Facility Element, San Diego County General Plan. .

Transportation Impact Fee Ordinance and Reports, April 2005, updated January 2008.

Institute of Transportation Engineers (ITE). Traffic Access and Impact Studies for Site Development (A Recommended Practice), 1991.

San Diego Association of Governments  
Draft Environmental Impact Report for the 2020 Regional Transportation Plan. Prepared by RECON, November 19, 1999.

2020 Regional Transportation Plan. Prepared by the San Diego Association of Governments, 1999a.

San Diego Traffic Engineers' Council (SANTEC) and the Institute of Transportation Engineers (ITE). SANTEC/ITE Guidelines for Traffic Impact Studies (TIS) in the San Diego Region (draft), March 2, 1999.

Shoup, Donald C. The Trouble with Minimum Parking Requirements, December 9, 1999.

## LEVELS OF SERVICE SUMMARY

### Background

#### Level of Service

Level of service (LOS) is a quality of service measure that describes motor vehicle operational conditions on a transportation facility, such as a roadway or intersection. This service measure is a general overall measurement of several conditions such as speed and travel time, freedom to maneuver, traffic interruption, comfort and convenience.

Six LOS categories are defined for each type of facility. Letters designate each level, from A to F, with LOS A representing the best operating conditions and LOS F the worst. Each LOS represents a range of operating conditions and the driver's perception of those conditions. Safety is not included in the measures that establish service levels.

Each transportation facility type has one or more of service measure that serves as the primary determinant of level of service for that facility type. This LOS-determining parameter is called the service measure or sometimes the Measure of Effectiveness (MOE). The MOE will vary from facility type to facility type. For instance, for intersections the MOE will be delay; for a road segment it may be the 24-hour volume, the volume to capacity ratio, speed or travel time along the facility.

#### Capacity

The capacity of a facility is the maximum number of persons or vehicles that can be expected to traverse a point or uniform section of road within a specified time frame under prevailing roadway, traffic and control conditions. Theoretically, this is the point in which the flow rate (vehicles/hour) on the facility is the highest. At lower traffic volumes, the peak hour operations will be low density with higher speeds. At higher traffic volumes, the peak hour operations will be of higher density, but at lower speeds. The flow rate can be measured in 15 minute, hourly or 24-hour intervals. Some general relationships/estimates have been established/assumed for converting from 24-hour average daily traffic measurements to peak hour measurements and vice-versa.

The highest volume attainable under LOS E defines the capacity of the arterial or collector. Operating conditions at capacity are unstable and difficult to predict. If this capacity is exceeded, operating conditions on the roadway change dramatically. Average travel speeds are extremely low, stop-and-go traffic occurs and excessive queuing may be present.

The capacity is related to level of service. The LOS E/LOS F criteria are identified as the capacity of the facility (roadway or intersection). Volumes to capacity ratios are calculated based upon these capacity (LOS E/LOS F) criteria.

## **Roadways**

Roadways are classified based upon the roadway's function, control conditions and type roadside development, including its specific use, density and intensity. Road classifications for roadways located within the unincorporated area are described in the County of San Diego's General Plan Circulation Element and in the County of San Diego Public Road Standards. The road classifications provided therein may be grouped into four categories, arterials, collectors, residential roads and industrial/commercial roads. A description of each category and the method of determining LOS for each are discussed below:

## **Freeways**

A freeway is defined as a divided highway with full control of access and two or more lanes for the exclusive use of traffic in each direction. Freeways provide uninterrupted flow. There are no signalized or stop-controlled intersections and direct access to and from adjacent property is not permitted. Access to the freeway is limited to ramp locations. Raised barriers, at-grade medians or continuous raised medians separate opposing directions of travel.

Operating conditions on a freeway primarily result from interactions among vehicles and drivers. Although speed is a major concern of drivers as related to service quality, freedom to maneuver within the traffic stream and proximity to other vehicles are equally noticeable concerns. These qualities are related to the density of the traffic stream. Unlike speed, density increases up to capacity.

The LOS criteria for freeways are defined to represent reasonable ranges in the three critical flow variables, speed, density and flow rate. They are as follows:

LOS A describes free flow operations. Free flow speeds prevail. Vehicles are almost completely unimpeded in their ability to maneuver in the traffic stream. The effects of incidents or point breakdowns are easily absorbed at this level.

LOS B represents reasonably free flow and free flow speeds are maintained. The ability to maneuver in the traffic stream is only slightly restricted, and the general level of physical and psychological comfort provided to drivers is still high. The effects of minor incidents and point breakdowns are still easily absorbed.

LOS C provides for flow with speeds at or near the free flow speed. Freedom to maneuver is noticeably restricted, and lane changes require more care and vigilance on the part of the driver. Minor incidents may still be absorbed, but the local deterioration in service will be substantial. Queues may be expected to form behind any significant blockage.

LOS D is the level at which speeds begin to decline slightly with increasing flows and density begins to increase somewhat more quickly. Freedom to maneuver is more

noticeably limited, and the driver experiences reduced physical and psychological comfort levels. Even minor incidents can be expected to create queuing, because the traffic stream has little space to absorb disruptions.

LOS E describes operations at capacity, the highest density value. Operations at this level are volatile, because there are virtually no usable gaps in the traffic stream. Vehicles are closely spaced, leaving little room to maneuver. Speeds still exceed 49 mph. At capacity the traffic stream has no ability to dissipate even the most minor disruption, and any incident can be expected to produce a serious breakdown with excessive queuing. Maneuverability in the traffic stream is extremely limited and the level of physical and psychological comfort afforded the driver is poor.

LOS F describes breakdowns in vehicular flow. Such conditions generally exist within queues forming behind breakdown points. These may occur for a number of reasons, such as traffic incidents, merges, and lane drops. The breakdowns occur when the ratio of existing demand to actual capacity (or of forecasted demand to estimated capacity) exceeds 1.00.

The level of service for freeway segments is estimated by calculating the demand to capacity or volume to capacity ratio. It is based upon the peak 15 min traffic flow as expressed in vehicles per hour. Adjustments to account for the types of vehicle in the traffic flow are provided in the HCM. Adjustments to the capacity to account for geometrics, grade and environmental factors, such as adverse weather conditions, are also provided.

### **Two-Lane Highways**

A two-lane highway is a two-lane undivided roadway with one lane for each direction of travel. Traffic signals are spaced over two miles apart along the highway. Passing a slower vehicle requires the use of the opposing lane as sight distance and gaps are available. As volumes and geometric restrictions increase the ability to pass decreases and platoons form. Motorists in platoons are subject to delay because they are unable to pass.

Many two-lane highways are located within the County of San Diego unincorporated area. These are primarily State highways such as SR 67, SR 76, SR 78 and SR 94. For State highways Caltrans design standards, which utilize a peak hour HCM analysis, is used. This methodology estimates traffic operations based upon terrain, geometric design and traffic conditions. Base conditions for terrain and geometric designs have been identified which are applicable for most route segments. Procedures to account for segments, which differ from the base conditions, are also provided. The methodology is typically applied to highway segments at least 2 miles long.

In the Highway Capacity Manual (HCM Ch.20) two-lane highways are categorized into two classes for analysis:

**Class I** – These are two-lane highways on which motorists expect to travel at relatively high speeds. These include major intercity routes connecting major traffic generators, daily commuters, or primarily links in the state or national highway network. They serve long distance trips or serve as connecting links between facilities that serve long trips.

**Class II** - These are two-lane highways on which motorists do not necessarily expect to travel at high speeds. They function as access routes to Class I facilities, serve as scenic/recreational routes or pass through rugged terrain. They often serve short trips, the beginning or ending portion of a longer trip or trips for which sightseeing/recreation plays a significant role.

The primary measures of level of service for Class I two-lane highways are percent time spent following (PTSF) and average travel speed (ATS). For Class II two-lane highways level of service is based only upon time spent following. Levels of service criteria of two-lane highways are defined based upon the peak period (15 min flow periods) and are intended for application to segments of significant length. They are defined as follows:

**LOS A** describes the highest quality of service, when motorists are able to travel at their desired speed. Without strict enforcement average speeds of 55 mph would be expected on Class I two-lane highways and platoons of three or more vehicles are rare. On Class II two-lane highways speeds may fall below 55 mph but motorists will not be delayed in platoons more than 40 % of their travel time.

**LOS B** characterizes traffic flow with speeds of 50 mph (slightly higher on level terrain), on Class I two-lane highways, and drivers are delayed in platoons up to 50 percent of the time. On Class II two-lane highways speeds may fall below 50 mph but motorists will not be delayed in platoons more than 55 % of their travel time.

**LOS C** describes further increases in traffic flow, resulting in noticeable increases in platoon formation, platoon size and frequency of passing impediments. The average speed still exceeds 45 mph on level terrain Class I two-lane highways. Although traffic flow is stable it is susceptible to congestion due to turning vehicles and slow-moving traffic. Percent time following may reach 65 %. On Class II two-lane highways speeds may fall below 45 mph but motorists will not be delayed in platoons more than 70 % of their travel time.

**LOS D** describes unstable flow. The two opposing traffic streams begin to operate separately and passing becomes extremely difficult. Turning vehicles and roadside distractions may cause disruptions to the traffic stream. The average speed of 40 mph can still be maintained on Class I two-lane highways, under base conditions, but mean platoon sizes of 5 to 10 vehicles are common. On Class II two-lane highways speeds

may fall below 40 mph but motorists will not be delayed in platoons more than 85 % of their travel time.

LOS E traffic flow conditions have a percent time following greater than 80% for Class I two-lane highways and greater than 85% on Class II two-lane highways. Speeds may drop below 40 mph on Class I highways and may be as low as 25 mph on sustained grades. Passing is virtually impossible. Platooning becomes intense as slower vehicles or other interruptions are encountered.

LOS F represents heavily congested flow and speeds are highly variable.

The highest volume attainable under LOS E defines the capacity of the two-lane highway. Generally, this is 3,200 peak hour trips in both directions. Operating conditions at capacity are unstable and difficult to predict.

### **Arterials and Collectors**

Arterials are roadways that primarily serve longer through trips. Providing access to abutting commercial and residential land uses is also an important function of arterials. Traffic signals are, typically, located at many intersections with public roads and major access points to adjacent land uses. Collectors are roadways provide both land access and traffic circulation. Their access function is more important than that of arterials and unlike arterials their operations is not always dominated by traffic signals.

On arterials, which are predominately uninterrupted on segments between major intersections, the Highway Capacity Manual 2000 evaluation method for Urban Streets may be used. Average travel speed on the road way is used as the determinant of operating LOS. The average travel speed is related to the traffic volume on the road. Exhibit 10-7 in the HCM 2000 provides a service volume Table that contains approximate hourly volumes and corresponding level of service estimates for different roadway types. Typically, the capacity of arterials, which have few interruptions between major intersections, is limited by the capacity of the intersections along the roadway.

The Highway Capacity Manual 2000 includes a method for evaluating level of service for urban streets. Urban streets are identified in the HCM 2000 as arterials with traffic signals spaced two miles or less apart. The HCM methodology primarily assesses the travel speed and level of service of the urban street based upon the operations and delay that occurs at the intersection along the urban street. A roadway's access function, however, is not assessed/included in this methodology. The level of access provided by a roadway should also be considered in evaluating its performance.

Most County arterials and collectors have frequent interruptions between major intersections. Capacity and level of service for arterials and collectors in the County of San Diego are usually determined based 24-hour average daily traffic according to Table 2 in the County of San Diego Standards for Public Roads. The 24-hour average daily traffic volumes are identified for each LOS category. They were based upon